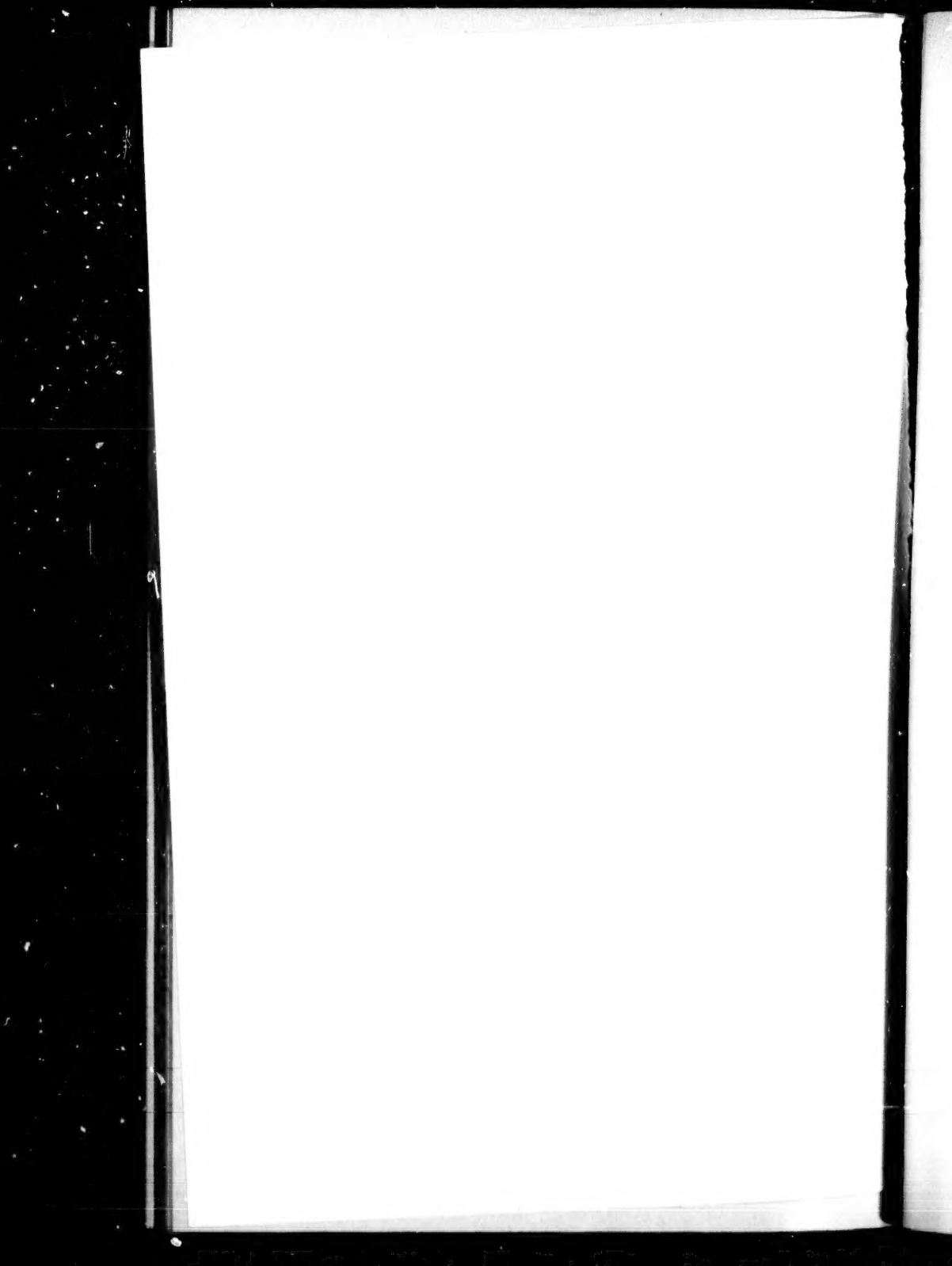




CONTRIBUTIONS

TO

NORTH AMERICAN ICHTHYOLOGY

BASED PRIMARILY ON THE

COLLECTIONS OF THE UNITED STATES NATIONAL MUSEUM.

II.

A.—Notes on *Cottidae*, *Etheostomatidae*, *Percidae*, *Centrarchidae*, *Aphododeridae*, *Dorysomatidae*, and *Cyprinidae*, with revisions of the genera and descriptions of new or little known species.

B.—Synopsis of the *Siluridae* of the fresh waters of North America.

BY

DAVID S. JORDAN.

WASHINGTON:
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1877.

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CONTRIBUTIONS
TO
NORTH AMERICAN ICHTHYOLOGY.
No. 2.

A.—NOTES ON COTTIDÆ, ETHEOSTOMATIDÆ, PERCIDÆ, CENTRARCHIDÆ, APHODODERIDÆ, UMBRIDÆ, ESOCIDÆ, DORYSOMATIDÆ, CYPRINIDÆ, CATOSTOMIDÆ, AND HYDONTIDÆ, WITH REVISIONS OF THE GENERA AND DESCRIPTIONS OF NEW OR LITTLE KNOWN SPECIES.

COTTIDÆ.

1. COTTOPSIS SPILOTUS, (Cope) Jor.

Uranidea spilota, COPE, Proc. Ac. Nat. Sci. Phila. 1865, 82.

Cottopsis ricei, NELSON, Bull. Ills. Trans. Nat. Hist., 1876.—JORDAN, Proc. Ac. Nat. Sci. Phila. 1877, 61.

An examination of the types of *U. spilota* shows their probable identity with Mr. Nelson's species as above indicated. Prof. Cope's specimens are in bad condition, and have lost the peculiar dermal spines. Prof. Gill thinks that *Cottopsis spilota* and *Cottopsis semiscaber* Cope are not truly *Cottopsis*, the only species properly referable to that genus, being *C. asper* Rich. (of which *C. parvus* Grd. is the young). At any rate, *C. spilota* and *C. semiscaber* form a well-marked group or section intermediate between *Cottopsis* and *Potamocottus*.

ETHEOSTOMATIDÆ.

2. AMMOCRYPTA BEANII, gen. et sp. nov.

Generic characters.—Allied to *Pleurolepis* Agassiz. Body greatly elongated, subcylindrical, and translucent. Head as in *Pleurolepis*, but

entirely naked; body entirely naked, except the caudal peduncle, which is sparsely covered with thin, imbedded scales, and a series of rather large scales along the sides, on which the lateral line runs; upper jaw somewhat protractile; mouth rather wide, nearly terminal; a single anal spine. The name *Ammocrypta* is given in allusion to the habit of hiding in the sand, which is characteristic of the species of this genus and *Pleurolepis*.

Specific characters.—General form of *Pleurolepis pellucidus*, but the head heavier. Depth about 6 in length (to base of caudal—as in all cases in this paper); head $3\frac{3}{4}$; mouth large, the upper jaw rather longest, and somewhat protractile; cheeks and opercles entirely naked. A series of rather large scales, about 65 in number, forming the lateral line; a few scattering scales immediately above or below lateral line; behind anal and second dorsal, the caudal peduncle is covered with small, thin, imbedded scales.

Fin rays: Dorsal X—10. Anal I, 9. The two dorsal fins very high, wide apart, about equal to each other and to the large anal. Caudal fin emarginate.

Color clear translucent, without bars or spots, the lateral line shining-golden in life (*Bean*). Spinous dorsal fin with a large black spot on the membrane anteriorly, another near the middle, and some small ones behind; other fins with their membranes dusted with small punctulations.

Habitat.—Notalbany River, near Tickfaw, La. Collected in December, 1876, by Dr. Tarleton H. Bean, of the Smithsonian Institution, for whom the species is named. The type—about $2\frac{1}{2}$ inches in length—is in the United States National Museum.

The much greater height of the dorsal and anal fins, as well as the generic character of the naked body, distinguish this species from its sand-diving relatives, *Pleurolepis pellucidus* and *P. vitreus*.

3. NANOSTOMA, Putnam, MSS., gen. nov.

The name of *Nanostoma*, a manuscript genus of Darters, has been current in ichthyological circles for some time, and it has once or twice appeared in print, but no attempt has ever been made to characterize it. I find in the National Museum two species of Etheostomoid fishes, labelled by Prof. Putnam *Nanostoma*, one of which seems to be identical with *Pacilichthys zonalis* Cope. These species cannot well be referred to *Pacilichthys*, as they have a complete lateral line. From

Boleosoma they are separated by the non-protractile upper jaw, and they seem to have little relation with the species referred to *Nothonotus*.

Nanostoma, then, appears to be a distinct genus, or at least a strongly marked section, and I propose to accept the name and to select, as the type of the group, *P. zonalis* Cope (= *N. pictum* Putnam, MSS.). *Nanostoma* bears somewhat the same relation to *Nothonotus* that *Boleichthys* does to *Pæcilichthys*.

Generic characters.—Body fusiform, little compressed, entirely scaly, without enlarged ventral plates. Mouth small, subinferior, the upper jaw not protractile; vomerine teeth; scales large; lateral line complete; cheeks and opercles scaly; dorsals well separated, the second much larger than anal, higher but rather shorter than spinous dorsal. The separation of the dorsals, the form of the body, the small size of the mouth, and the large size of the scales separate *Nanostoma* from *Nothonotus*. The scaliness of the cheeks, neck, and throat are differences of some importance.

4. HADROPTERUS TESSELLATUS, *sp. nov.*

† *Boleosoma tessellatum*, THOMPSON, Appendix Hist. Vt. p. 31, 1853 (not of De Kay, 1842).

† *Cottogaster tessellatus*, PUTNAM, Bull. Mus. Comp. Zool. i, 1863, 5.

† *Boleosoma tessellatum*, THOMPSON, *nec* De Kay, Jordan & Copeland, Bull. Buff. Soc. Nat. Hist. 1876, 135, 163.—JORDAN, Man. Vert. 1876, 222.

A specimen of an Etheostomoid in the United States National Museum, labelled *Cottogaster*, has the characters assigned by Prof. Putnam to his genus of that name, and is presumably the species which he catalogues, without description, as *C. tessellatus*. Prof. Putnam accepted the specific name from Thompson, who seems to have supposed, erroneously, that he was describing De Kay's *Boleosoma tessellatum*. Prof. Putnam states that his *Cottogaster tessellatus* is a species of *Boleosoma*, but the species now under consideration is certainly a *Hadropterus*, as I understand the latter genus. I therefore propose for my species the name of *Hadropterus tessellatus* Jordan. If Prof. Putnam's species proves different, it should be renamed, as there has been already a *tessellatum* in *Boleosoma*, and mine will keep its name. If the two are, as I suspect, identical, then we will write *Hadropterus tessellatus* (Putnam) Jordan, and no confusion in nomenclature need arise.

H. tessellatus has the form of *Imostoma shumardii*, fusiform, with a broad, heavy head; mouth wide, the upper jaw rather longest, not protractile; cheeks and opercles naked († in life); chest naked; neck

scaly; no ventral plates; belly entirely scaled; lateral line complete; anal about equal to second dorsal.

Fin rays:—Dorsal about X—12. Anal II, 8. The soft rays barred. Coloration otherwise obliterated. Length of type $2\frac{1}{2}$ inches.

Habitat.—Foxburgh, Pa., Allegheny River. Type No. 1199, United States National Museum.

5. ERICOSMA EVIDES, *Jordan & Copeland, gen. nov.*

Alvordius evides, JORDAN & COPELAND, Proc. Acad. Nat. Sci. Phila. 1877, p. 51.

The coloration of this species, described in the paper above cited, is that of the female fish. The recent collection of a very large number of both sexes, in the breeding dress, at the same locality where the types were taken, enables me to supplement the original account. The following are the life colors of a male fish in spring:—

Lateral bars, which in the female are black or brown, a dark, rich blue-green, with metallic lustre. At the base of the bars they are somewhat connected by a narrow band of a greenish-bronze color, passing below the lateral line. Just below this is a narrow streak of yellowish—a sort of luminous, sunshine color. Above, toward the back, in each of the interspaces between the bars, is a bright blotch of bronze-red. The entire lower parts of the body are of a bright clear yellow, which becomes on the under side of the head, throat, and branchiostegals a very bright orange-red. A blackish-green bar below eye and a streak forward from it.

Dorsal fin orange-colored, with a bright bronze edge. a blackish spot on the last rays. Second dorsal and caudal pale orange; two luminous spots at base of caudal fin; anal bronze, with blue-black shading. Ventral fins dark blue-black. Pectorals faintly orange. Cheeks orange-red, exactly the color of bright iron-rust.

Males with the rays of the ventral and anal fins covered with small bluish tubercles, exactly as in some *Cyprinidae*.

This species is probably not strictly congeneric with the type of *Alvordius*. It differs from the latter genus chiefly in the less complete dentition and the reduced number of vertebrae, the latter character giving to the fish a short, compact form, quite unlike that of *Alvordius aspro* and related species. I propose to designate the group typified by *A. evides* by the name of *Ericosma* ($\epsilon\pi\rho$, springtime; $\kappa\omicron\sigma\mu\epsilon\omega$, to adorn), from the gay coloration of the males at that season.

The principal characters separating *Ericosma* from *Alvordius* are shown below.

ALVORDIUS, Grd.

(Type, *A. maculatus* Grd.)

Vertebræ numerous, about 44 in all; 22 in front of anus.

Body and head elongate; mouth wide, with well-developed teeth on vomer and on palatines.

Sexes similar; males never with the fins tuberculate.

Dorsal spines 12 to 15; the two dorsal fins well apart.

Caudal fin slightly emarginate.

ERICOSMA, Jordan.

(Type, *Alvordius evides* Jor. & Copei.)

Vertebræ fewer, about 39 in all; 17 in front of anus.

Body short and compact; mouth small, with about six minute teeth on vomer and none on palatines.

Sexes dissimilar; the males brilliantly colored, with the lower fins tuberculate.

Dorsal spines 10 or 11; the two fins contiguous.

Caudal fin deeply emarginate.

6. *RHEOCRYPTA*, Jordan, gen. nov.

Allied to *Imostoma* and *Alvordius*. Body rather slender and elongate, with a pretty large, rather long, and somewhat narrowed head, resembling that of *Boleosoma*; mouth small, horizontal, subinferior, with weak teeth in the jaws, five or six small teeth on the vomer, and none on the palatines; upper jaw protractile, separated by a distinct furrow from the forehead; two distinct dorsal fins, of which the second is rather smaller than the first and than anal; anal with two distinct spines; ventral region with a series of enlarged plates, as in *Alvordius* and *Percina*, these caducous, in many specimens replaced by a scaleless strip; cheeks naked; opercles with a few scales; lateral line complete.

This genus is perhaps nearest *Imostoma*, with which it agrees in the protractile mouth. It differs from *Imostoma* and agrees with *Alvordius* Grd. in the presence of ventral plates. The name *Rheocrypta* (ῥεῶ, to flow rapidly—κρυπτός, concealed, i. e., hiding in the rapids) is given in allusion to the peculiar habits of this interesting species.

7. *RHEOCRYPTA COPELANDI*, Jordan, sp. nov.

Head $4\frac{1}{2}$ in length; depth $5\frac{1}{2}$; eye large, $3\frac{1}{2}$ in head; scales moderate, strongly ctenoid, 56 in lateral line; those of the ventral much enlarged, forming serrated plates; cheeks naked; opercles with a few scales; neck and throat naked. Fin-rays:—Dorsal X-XII, 10; anal II, 9.

General color a semi-transparent brownish-yellow, a series of rather small horizontally oblong black spots along lateral line, forming an interrupted lateral band; back tessellated, as in *Boleosoma*, a blackish streak forward from eye and another downward; ventral fins dusky; vertical fins with dusky specks, but scarcely barred; a black spot on anterior rays of spinous dorsal.

Length of specimens 2 to 2½ inches.

Habitat.—White River, Indiana. The specimens in my possession, some thirty in number, were all taken at the same point, a shallow rapid, where the river flows over fine gravel. This locality, the "Red Bridge", about five miles north of Indianapolis, is the only one thus far known for this species and for *Ericosoma evides*. It is the best point for the collection of *Pleurolepis pellucidus* which I know of in the West. As many as thirty specimens of the latter species have been taken there at low water at a single haul of the net. *Rheocrypta copelandi* and *Ericosoma evides* are both extremely local, as a few rods above or below the rapids it is impossible to find either.

I dedicate this species to the memory of my friend, the late Professor Copeland, to whose patient study of these beautiful little fishes we owe much that is now known of their habits and ways. I have named this graceful species, taken at the rapids where he and I had so often fished together, for him, in recognition of his genuine love of nature, and in token of our long scientific association and personal friendship.

8. *ARLINA ATRIPINNIS*, Jordan, *sp. nov.*

I admit the genus *Arlina* provisionally for those species of *Boleosoma* which have two well-developed anal spines; but, as I have never seen *Arlina effulgens*, the type of the genus, I am not certain that that species possesses this character.

The species of this genus to which the above name has been given may be thus characterized:—

Body rather short for the genus, somewhat compressed behind; the depth $4\frac{1}{2}$ in length. Head extremely short and deep, $4\frac{1}{2}$ in length of body; the snout very short and bluntly rounded. Eye quite large, $3\frac{1}{2}$ in head. Mouth quite small, with equal jaws, the upper protractile. Cheeks and opercles scaly, the scales on cheeks small and closely set; a triangular series of scales above the opercle behind the eye. Throat smooth; neck above closely scaly; no ventral plates; belly closely scaled.

Fins large; rays, dorsal XII, 10; anal II, 7. Base of spinous dorsal $1\frac{1}{2}$ times length of head, $3\frac{1}{2}$ in length; the spines high, the highest about $\frac{2}{3}$ the length of the head.

Dorsal fins contiguous, with a slight connecting membrane. Second dorsal higher, but smaller than first, its base about equal to the length of the head. Pectoral fins moderate, reaching past the middle of the dorsal.

Color olivaceous; head above entirely black; a black bar below eye; back with eight dark cross-blotches; about eleven bar-like blotches, somewhat indistinct, arranged along the lateral line. Fins chiefly black. Membranes of the second dorsal and ventral fins entirely black, that of spinous dorsal with a broad, black, horizontal bar at base, above which are numerous distinct black oblique streaks; anal with a broad black bar and caudal and pectorals largely dusky. It is likely that females, and male fish at other seasons, will be found to be paler in color.

Length of type-specimen $2\frac{1}{2}$ inches.

Collected in a tributary of the Cumberland River, near Nashville, Tenn., by Prof. A. Winchell, to whom the National Museum is indebted for a fine series of Tennessee fishes.

9. ETHEOSTOMA SQUAMICEPS, *sp. nov.*

Catonotus fontinalis, PUTNAM, MSS. (1860) (not *E. fontinalis* Raf.).

A species of the genus *Etheostoma*, found in the streams of Kentucky, has been for a long time indicated in manuscript, but has never yet been fully described.

The following account is taken from two fine specimens in the United States National Museum (No. 1345), collected by Dr. Bebb, at Russellville, Ky., and labelled *Catonotus fontinalis* by Prof. Putnam.

Body oblong, rather elongate, pretty strongly compressed, the general form being much like that of *E. flabellaris*, but with deeper caudal peduncle, the depth being about one-fifth of the length. Head large, $3\frac{1}{2}$ in length, shorter and stouter than in *E. flabellaris*; the jaws much shorter and exactly equal; eye rather large, $4\frac{1}{2}$ in head. Cheeks and opercles thickly scaly, as are the throat and region in front of the dorsal; middle line of the belly with ordinary scales. Lateral line almost complete, wanting on about ten of the posterior scales, but with occasional perforated scales behind the continuous series.

Scales about 5-50-6. Fin-rays:—dorsal IX (or VIII), 12; anal II, 7 or 8.

Spinous dorsal low and short, the spines about equal, the longest less than half the height of the soft rays of the second dorsal. The bases of the two fins are about equal, and they are slightly connected by membrane.

In the male specimen, the dorsal spines are somewhat swollen and white at their tips, but rather less so than is usual in the genus.

Color partly obliterated by the alcohol. The male is rather dark, not spotted, striped, or banded. The female is somewhat mottled, and has about six cross-blotches on the back. The second dorsal, caudal, and pectorals are barred with black and pale, the caudal especially so. The other fins are black in the male; in the female, the lower fins are pale. A large black humeral spot. Length $2\frac{3}{4}$ inches.

This species is technically an *Etheostoma*, of which genus it possesses the general form, fin coloration, and dorsal fin. It has the mouth of *Pæciliochthys*, the scaly head of *Nanostoma*, with a condition of the lateral line intermediate between *Pæciliochthys* and *Nanostoma*. The other species of *Etheostoma* have the head naked.

The specific name *fontinalis* was used by Prof. Putnam on the supposition that this species is identical with that described under the same name by Rafinesque.

ANALYSIS OF GENERA OF ETHEOSTOMATIDÆ.

The following analytical synopsis gives the characters at present assigned to the genera of *Etheostomatidæ* admitted in this paper. The categories recognized are very closely related, but are susceptible of definition:—

- *. Lateral line complete; body much elongate, subcylindrical, pellucid, with at least the entire ventral region naked:
 - a. Body entirely naked, except the caudal peduncle and the lateral line; dorsal fins high, well separated, equal to the anal fin and to each other; a single anal spine; head entirely scaleless; mouth large, with vomerine teeth, the upper jaw subprotractile.....AMMOCRYPTA, 1.
 - aa. Body covered above with small thin imbedded scales, the ventral region entirely naked, the dorsal scales obscure but present; dorsal fins small, wide apart; two anal spines; cheeks and opercles scaly; mouth large, with vomerine teeth, the upper jaw subprotractile.....PLEUROLEPIS, 2.
- ** . Lateral line complete; body less elongate, entirely scaly, or with definitely naked areas on throat, neck, or ventral line:
 - †. Second dorsal not larger than spinous dorsal, and little, if any, larger than anal; the dorsal fins distinct, the first the longer and usually the larger; body little compressed; two distinct anal spines (except in *Aluordius pellatus*, a species of uncertain affinities):

b. Upper jaw not protractile; vomerine teeth present:

c. Mouth narrow, inferior, overlapped by a tapering, truncate, more or less pig-like snout; ventral plates present, or, if fallen, a naked strip; body elongated; cheeks and opercles scaly; size largest of all the darters, PERCINA, 3.

cc. Mouth wider, terminal, the upper jaw being but little longer than the lower:

d. Ventral plates developed, or, if fallen, middle line of belly with a naked strip:

e. Body and head elongate; the vertebræ in increased number, more than 20 in front of anus; well-developed teeth on vomer and palatines; dorsal spines 12 to 15; fins never tuberculate.....ALVORDIUS, 4.

ee. Body and head shortened; vertebræ fewer, less than 20 in front of anus; a few minute teeth on vomer and none on palatines; dorsal spines 10 to 12; colors brilliant, the male in spring with the lower fins tuberculate,

ERICOSMA, 5.

dd. Ventral plates not developed; middle line of belly scaled like the sides,

HADROPTERUS, 6.

bb. Upper jaw protractile, a distinct furrow separating it from the skin of the forehead:

f. No ventral plates; posterior ventral region scaled; anterior region largely naked; vomer well toothed; head and body stout and heavy; cheeks and opercles scaly; anal fin (in adult males?) greatly elevated, reaching to base of caudal fin.....IMOSTOMA, 7.

ff. Ventral plates well developed, or, if fallen, a naked strip; vomer with a few minute teeth; palatines naked; body rather slender, with rather narrow head and smaller subinferior mouth; cheeks naked; opercles scaly; anal fin not enlarged.....RHEOCRYPHA, 8.

†. Second dorsal considerably larger than anal fin; no ventral plates, the middle line of the belly always covered with small scales like those of the sides:

g. Upper jaw protractile:

h. No teeth on vomer or palatines; mouth small, contracted, subinferior; head short and thick, with swollen cheeks; spinous dorsal rather long; cheeks and opercles scaly; anal spines strong; body elongated, little compressed,

DIPLESIUM, 9.

hh. Vomerine teeth present; dorsals contiguous, but distinct; the spinous dorsal short; head narrowed; the mouth rather small, horizontal, subinferior:

i. Anal spines two, well developed; the first the longer.....ARLINA, 10.

ii. Anal spine single, more or less obscure and undifferentiated from the soft rays.....BOLEOSOMA, 11.

gg. Upper jaw not protractile:

j. Dorsal fins well apart; body fusiform, little compressed; scales large; cheeks and opercles scaly; mouth small, horizontal, subinferior (as in *Boleosoma*); caudal peduncle rather slender.....NANOSTOMA, 12.

jj. Dorsal fins slightly connected at base; body rather short, deep, strongly compressed; scales small; cheeks naked; mouth rather large, oblique (as in *Pacilichthys*); caudal peduncle deep.....NOTHONOTUS, 13.

***. Lateral line incomplete or wanting; no ventral plates; upper jaw not protractile; second dorsal larger than anal; vomer with teeth:

k. Lateral line present on anterior part of body:

l. Dorsal fins contiguous, the membrane of the first reaching to the base of the second:

m. Spinous dorsal fin well developed, two-thirds or more the height of the second; the spines graduated, never ending in little fleshy knobs; lateral line extending more than half the length of the body; mouth moderate, the upper jaw usually a little the longer; opercles scaly; cheeks naked; body rather short and deep.....PACILICHTHYS, 14.

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- mm. Spinous dorsal low and small, the spines subequal, scarcely half the height of the soft rays, in males ending in little fleshy knobs; mouth rather large, the lower jaw the longest; body elongated, compressed; lateral line extending less than half the length of the body; head naked (except in the aberrant *E. squamiceps*, which is an exception to all these characters, save those drawn from the dorsal fin).....ETHEOSTOMA, 15.
- ll. Dorsal fins about equal, well separated; body elongated; cheeks and opercles scaly:
- n. Lower jaw longest; lateral line unknown (genus admitted provisionally, the type-species apparently has not been seen since its original description):
ALVARIUS, 16.
- nn. Jaws about equal; lateral line curved upward over the pectorals, not reaching to middle of body; body elongated.....BOLEICHTHYS, 17.
- kk. No lateral line; dorsal fins small, subequal, well separated; mouth small, with nearly equal jaws; scales large; size smallest of all spiny-rayed fishes,
MICROPERCA, 18.

CATALOGUE OF SPECIES OF ETHEOSTOMATIDÆ.

The following catalogue includes those species of *Etheostomidae* which appear to be valid, with the geographical distribution of each so far as recorded. Species unknown to me are indicated by a star (*). In arranging the genera, I begin with the type most generalized, or most like ordinary *Percidæ*, *Hadropterus*. The relations of the aberrant genera *Pleurolepis* and *Ammocrypta* are probably most with *Alvordius*, a fact which cannot well be shown in a linear series. I omit several species, which very likely may prove valid, but of whose relations I can form no definite opinion from the published accounts. In each genus, the type-species is placed first.

HADROPTERUS, Agassiz.

1. *Hadropterus nigrofasciatus*, Ag.—South Carolina to Tennessee and Louisiana.
2. *Hadropterus tessellatus*, Jordan.—Vermont (?) to Pennsylvania.
3. *Hadropterus aurantiacus*, (Cope) Jor.*—Virginia to Tennessee.

ERICOSMA, Jordan.

4. *Ericosma evides*, Jordan & Copeland.—Wabash Valley.

ALVORDIUS, Girard.

5. *Alvordius maculatus*, (Grd.).—Pennsylvania to North Carolina.
6. *Alvordius aspro*, Cope & Jordan.—Upper Mississippi Valley and Upper Lake Region.
7. *Alvordius nevisensis*, Cope.*—North Carolina.

8. *Alvordius peltatus*, (Stauffer,) Cope & Jor.*—Conestoga River, Pennsylvania.
9. *Alvordius macrocephalus*, Cope.—Upper Ohio Valley.
10. *Alvordius phoxocephalus*, (Nelson) Cope & Jordan.—Indiana to Tennessee and Kansas.

PERCINA, *Haldeman*.

11. *Percina caprodes*, (Raf.) Grd.—Great Lake Region to Alabama.
12. *Percina carbonaria*, (B. & G.) Grd.—Texas.
13. *Percina zebra*, Agassiz.—Great Lake Region (*d. s.*).
14. *Percina manitou*, Jordan.—Indiana to Minnesota.

RHEOCRYPHA, *Jordan*.

15. *Rheocrypta copelandi*, Jordan.—Wabash Valley.

IMOSTOMA, *Jordan*.

16. *Imostoma shumardii*, (Grd.) Jor.—Indiana to Iowa and Arkansas.

DIPLESIUM, *Rafinesque*.

17. *Diplesium blennioides*, Raf.—Mississippi Valley.
18. *Diplesium newmani*, (A g.) Jor. & Copel.—Tennessee River.
19. *Diplesium simoterum*, (Cope) Copeland.—Cumberland and Upper Tennessee Rivers.

BOLEOSOMA, *De Kay*.

20. *Boleosoma olmstedii*, (Storer) Ag.—Great Lakes to New England and south to Georgia, east of the Alleghanies.
21. *Boleosoma atromaculata*, (Grd.) Jor.—New York to Virginia (? var.).
22. *Boleosoma nigra* (Raf.) Jor.—Mississippi Valley and Upper Great Lakes.
23. *Boleosoma æsopus*, Cope.*—Alleghany River.
24. *Boleosoma mesæa*, (Cope) Jordan.—Kansas (*d. g.*).

ARLINA, *Girard*.

25. *Arlina effulgens*, Grd.—Maryland to North Carolina (*d. g.*).
26. *Arlina stigmæa*, Jordan.—Georgia to Louisiana.
27. *Arlina maculatriceps*, (Cope) Jordan* (*d. g.*).
28. *Arlina atripinnis*, Jordan.—Cumberland River.

NANOSTOMA, *Putnam*.

29. *Nanostoma zonalis*, (Cope) Jordan.—Mississippi Valley.

NOTHONOTUS, *Agassiz*.

30. *Nothonotus maculatus*, (Kirt.) Ag.—Ohio.
 31. *Nothonotus camurus*, (Cope) Jor.—Ohio Valley.
 32. *Nothonotus sanguifluus*, (Cope) Jor.*—Cumberland River.
 33. *Nothonotus vulneratus*, (Cope) Jor.*—Tennessee to North Carolina (*d. g.*).
 34. *Nothonotus rufilineatus*, (Cope) Jordan.*—Kentucky to North Carolina.

PÆCILICHTHYS, *Agassiz*.

35. *Pæcilichthys variatus*, (Kirtland) Ag.—Upper Mississippi Valley and tributaries of Lake Erie and Lake Michigan.
 36. *Pæcilichthys spectabilis*, Agassiz.—Upper Mississippi Valley and tributaries of Lakes Erie and Michigan.
 37. *Pæcilichthys lepidus*, Girard.—Texas and west.
 38. *Pæcilichthys punctulatus*, Agassiz.—Missouri to Arkansas.
 39. *Pæcilichthys leonensis*, (Grd.) Jor. & Copel.*—Texas (*d. g.*).
 40. *Pæcilichthys grahami*, (Grd.) Jor. & Copel.*—Texas.

ETHEOSTOMA, *Rafinesque*.

41. *Etheostoma flabellaris*, Rafinesque.—Ohio Valley to Tennessee and Virginia.
 42. *Etheostoma linslii*, H. R. Storer.—Western New York (? var).
 43. *Etheostoma kennicottii*, (Putnam) Jor.*—Illinois (*d. s.*).
 44. *Etheostoma lineolata*, (Agassiz) Jordan.—Wisconsin to Iowa (? var.).
 45. *Etheostoma squamiceps*, Jordan.—Ohio Valley, Kentucky.

ALVARIUS, *Girard*.

46. *Alvarius lateralis*, Grd.*—Texas, Mexico.

BOLEICHTHYS, *Girard*.

47. *Boleichthys exilis*, Grd.*—Upper Missouri Region.
 48. *Boleichthys eos*, Jordan & Copeland.—Tributaries of Great Lakes and Upper Mississippi River.
 49. *Boleichthys crochrous*, (Cope) Jordan.—New Jersey, Pennsylvania.
 50. *Boleichthys elegans*, Girard.—Georgia to Texas.

51. *Boleichthys gracilis*, (Grd.) Jordan.—Texas.
 52. *Boleichthys fusiformis*, (Grd.) Jordan.—Massachusetts.
 53. *Boleichthys barratti*, (Grd.) Jordan.—North Carolina to Georgia.
 54. *Boleichthys warreni*, Grd.*—Upper Missouri.

MICROPERCA, Putnam.

55. *Microperca punctulata*, Putnam.—Upper Mississippi Valley and tributaries of Lake Michigan.

PLEUROLEPIS, Agassiz.

56. *Pleurolepis pellucidus*, (Baird) Agassiz.—Ohio Valley.
 57. *Pleurolepis vitreus*, (Cope) Jord. & Copel.*—North Carolina and Tennessee.

AMMOCRYPTA, Jordan.

58. *Ammocrypta beanii*, Jordan.—Louisiana.

Incertæ sedis.

- Etheostoma tessellata*, Storer.*—Florence, Ala. (? *Pæcilichthys*).
Etheostoma cinerea, Storer.*—Florence, Ala. (? *Pæcilichthys*).
Aplesion pottsii, Grd.*—Chihuahua, Mexico (? *Pæcilichthys*).
Diplesion fasciatus, Grd.*—Texas (? *Pæcilichthys*).

LIST OF NOMINAL SPECIES OF ETHEOSTOMATIDÆ.

The following list includes all the species of *Etheostomatidæ* described in works to which I have access, arranged in chronological order, with my identification of each. Those species of which I have examined the type-specimens are designated by a dagger (†).

Nominal species.	Date.	Identification.
<i>Sciaen caprodes</i> , Raf.	1818	<i>Percina caprodes</i> .
<i>Etheostoma flabellaris</i> , Raf.	1819	<i>Etheostoma flabellaris</i> .
<i>Etheostoma blennioides</i> , Raf.	1819	<i>Diplesium blennioides</i> .
<i>Etheostoma flabellata</i> , Raf.	1820	<i>Etheostoma flabellaris</i> .
<i>Etheostoma nigra</i> , Raf.	1820	<i>Boleosoma nigra</i> .
<i>Pegedictis ictalops</i> , Raf.	1820	<i>Etheostoma flabellaris</i> .
<i>Etheostoma fontinalis</i> , Raf.	1820	<i>Etheostoma flabellaris</i> .
<i>Etheostoma variata</i> , Kirt.	1840	<i>Pæcilichthys variatus</i> .
<i>Etheostoma maculata</i> , Kirt.	1840	<i>Nothonotus maculatus</i> .
<i>Etheostoma olmstedii</i> , Stor.	1842	<i>Boleosoma olmstedii</i> .
<i>Percn nebulosa</i> , Hald.	1842	<i>Percina caprodes</i> .

Nominal species.	Date.	Identification.
<i>Perca minima</i> , Hald	1842	<i>Boleosoma olmstedii</i> .
<i>Pileoma semifasciata</i> , De Kay	1842	<i>Percina caprodes</i> .
<i>Boleosoma tessellata</i> , De Kay	1842	<i>Boleosoma olmstedii</i> .
<i>Percina bimaculata</i> , Hald	1843	<i>Percina caprodes</i> .
<i>Etheostoma cærulea</i> , Stor	1845	<i>Pœcilichthys variatus</i> .
<i>Etheostoma tessellata</i> , Stor	1845	(?)
<i>Etheostoma cinerea</i> , Stor	1845	(?)
<i>Pileoma zebra</i> , Ag	1850	<i>Percina (caprodes var. ?) zebra</i> .
<i>Boleosoma maculatum</i> , Ag	1850	<i>Boleosoma nigra</i> .
<i>Etheostoma linsleyi</i> , H. R. Stor	1850	<i>Etheostoma (flabellaris var. ?) linslii</i> .
<i>Pœcilosoma erythrogaster</i> , Kirt	1854	<i>Pœcilichthys variatus</i> .
<i>Pœcilichthys spectabilis</i> , Ag. †	1854	<i>Pœcilichthys spectabilis</i> .
<i>Pœcilichthys versicolor</i> , Ag	1854	<i>Pœcilichthys variatus</i> .
<i>Pœcilichthys punctulatus</i> , Ag †	1854	<i>Pœcilichthys punctulatus</i> .
<i>Catonotus lineolatus</i> , Ag	1854	<i>Etheostoma (flabellaris var. ?) lineolata</i> .
<i>Hadropterus nigrofasciatus</i> , Ag	1854	<i>Hadropterus nigrofasciatus</i> .
<i>Hyostoma newmani</i> , Ag. †	1854	<i>Diplesium newmani</i> .
<i>Boleosoma fusiforme</i> , Grd. †	1854	<i>Boleichthys fusiformis</i> .
<i>Boleosoma barratti</i> , Holbr	1855	<i>Boleichthys barrattii</i> .
<i>Pileoma carbonaria</i> , B. & G. †	1856	<i>Percina carbonaria</i> .
<i>Pœcilichthys lepidus</i> , B. & G. †	1856	<i>Pœcilichthys lepidus</i> .
<i>Arlina effulgens</i> , Grd	1859	<i>Arlina effulgens</i> .
<i>Estrella atromaculata</i> , Grd	1859	<i>Boleosoma (olmstedii var. ?) atromaculata</i> .
<i>Oligocephalus humeralis</i> , Grd	1859	<i>Etheostoma flabellaris</i> .
<i>Alvordius maculatus</i> , Grd. †	1859	<i>Alvordius aspro</i> .
<i>Catonotus fasciatus</i> , Grd	1859	<i>Etheostoma flabellaris</i> .
<i>Hadropterus maculatus</i> , Grd	1859	<i>Alvordius maculatus</i> .
<i>Hadropterus shumardii</i> , Grd	1859	<i>Imostoma shumardii</i> .
<i>Alvarius lateralis</i> , Grd	1859	<i>Alvarius lateralis</i> .
<i>Diplesium fasciatus</i> , Grd	1859	<i>Pœcilichthys sp. (?)</i>
<i>Aplesion pottsi</i> , Grd	1859	<i>Pœcilichthys sp.</i>
<i>Oligocephalus grahami</i> , Grd	1859	<i>Pœcilichthys sp. (?)</i>
<i>Oligocephalus leonensis</i> , Grd	1859	<i>Pœcilichthys sp. (?)</i>
<i>Oligocephalus pulchellus</i> , Grd	1859	<i>Pœcilichthys sp. (?)</i>
<i>Boleosoma gracile</i> , Grd. †	1859	<i>Boleichthys gracilis</i> .
<i>Boleichthys exilis</i> , Grd	1859	<i>Boleichthys exilis</i> .
<i>Boleichthys whipplei</i> , Grd	1859	<i>Pœcilichthys punctulatus</i> .
<i>Boleichthys elegans</i> , Grd	1859	<i>Boleichthys elegans</i> .
<i>Boleichthys warreni</i> , Grd	1859	<i>Boleichthys warreni</i> .
<i>Pœcilosoma transversum</i> , Abbott †	1860	<i>Pœcilichthys variatus</i> .
<i>Pileoma cymatogrammum</i> , Abbott †	1860	<i>Diplesium blennioides</i> .

Nominal species.	Date.	Identification.
<i>Asproperca zebra</i> , Heckel.....	1860	<i>Percina caprodes</i> .
<i>Catonotus kennicottii</i> , Putn.....	1863	<i>Etheostoma</i> sp.
<i>Microperca punctulata</i> , Putn.†.....	1863	<i>Microperca punctulata</i> .
<i>Cottogaster tessellatus</i> , Putn.....	1863	<i>Hadropterus tessellatus</i> (?).
<i>Pleurolepis pellucidus</i> , (Baird) Ag.....	1863	<i>Pleurolepis pellucidus</i> .
<i>Pœcilichthys mesæus</i> , Cope †.....	1864	<i>Boleosoma mesæa</i> .
<i>Etheostoma peltatum</i> , Stauff.....	1864	<i>Alvordius peltatus</i> .
<i>Hololepis erochrous</i> , Cope †.....	1864	<i>Boleichthys erochrous</i> .
<i>Etheostoma macrocephalum</i> , Cope †.....	1866	<i>Alvordius macrocephalus</i> .
<i>Boleosoma brevipinne</i> , Cope †.....	1868	<i>Boleosoma nigra</i> .
<i>Cottogaster aurantiacus</i> , Cope.....	1868	<i>Hadropterus aurantiacus</i> .
<i>Pœcilichthys zonalis</i> , Cope †.....	1868	<i>Nanostoma zonalis</i> .
<i>Hyostoma blennioperca</i> , Cope †.....	1868	<i>Diplesium blennioides</i> .
<i>Hyostoma simoterum</i> , Cope.....	1868	<i>Diplesium simoterum</i> .
<i>Etheostoma nevisense</i> , Cope.....	1870	<i>Alvordius nevisensis</i> .
<i>Pœcilichthys sanguifluus</i> , Cope.....	1870	<i>Nothonotus sanguifluus</i> .
<i>Pœcilichthys camurus</i> , Cope.....	1870	<i>Nothonotus camurus</i> .
<i>Pœcilichthys rufilineatus</i> , Cope.....	1870	<i>Nothonotus</i> (?) <i>rufilineatus</i> .
<i>Pœcilichthys vulneratus</i> , Cope.....	1870	<i>Nothonotus</i> (?) <i>vulneratus</i> .
<i>Pœcilichthys vitreus</i> , Cope.....	1870	<i>Pleurolepis vitreus</i> .
<i>Boleosoma maculaticeps</i> , Cope.....	1870	<i>Arlina maculaticeps</i> .
<i>Boleosoma æsopus</i> , Cope.....	1870	<i>Boleosoma æsopus</i> .
<i>Plesioperca anceps</i> , Le Vaillant.....	1873	<i>Hadropterus nigrofasciatus</i> .
<i>Boleosoma mutatum</i> , Le Vaillant.....	1873	<i>Boleosoma nigra</i> .
<i>Boleichthys eos</i> , Jordan & Copeland †....	1876	<i>Boleichthys eos</i> .
<i>Etheostoma phoxocephalum</i> , Nelson †....	1876	<i>Alvordius phoxocephalus</i> .
<i>Alvordius evides</i> , Jor. & Copel †.....	1877	<i>Ericosma evides</i> .
<i>Alvordius aspro</i> , Cope & Jordan.....	1877	<i>Alvordius aspro</i> .
<i>Percina manitou</i> , Jor. †.....	1877	<i>Percina manitou</i> .
<i>Boleosoma stigmæum</i> , Jor.†.....	1876	<i>Arlina stigmæa</i> .
<i>Ammocrypta beanii</i> , Jor. †.....	1877	<i>Ammocrypta beanii</i> .
<i>Hadropterus tessellatus</i> , Jor. †.....	1877	<i>Hadropterus tessellatus</i> .
<i>Rheocrypta copelandi</i> , Jor.†.....	1877	<i>Rheocrypta copelandi</i> .
<i>Arlina atripinnis</i> , Jor.†.....	1877	<i>Arlina atripinnis</i> .
<i>Etheostoma squamiceps</i> , Jor.....	1877	<i>Etheostoma squamiceps</i> .

CENTRARCHIDÆ.

10. EUPOMOTIS.

Eupomotis, GILL & JORDAN, Field and Forest, 1877, v. 2, p. 190.

In the *Journal de Physique*, June, 1819, page 420,* Rafinesque first proposes the name *Lepomis* for the American Sunfishes, the type to be *Labrus auritus* of authors. The genus *Lepomis* he then proposes to divide into two subgenera, *Pomotis* and *Apomotis*, the former having the body rounded and the opercle auriculated, the latter having the body rounded or oblong and the opercle without auricle.

Of auriculated species, only one, *auritus*, is mentioned. This species is then obviously the type of *Pomotis*; but it had been already indicated as the type of *Lepomis*. *Pomotis* then is typical *Lepomis*, and is a simple synonym of the latter name.

In the *Ichthyologia Ohiensis*, in 1820, Rafinesque characteristically changed some of these names; *Lepomis* here becomes *Ichthelis*, and *Apomotis*, *Telipomis*. *Pomotis* is still used in the same sense as before. In 1829, Cuvier and Valenciennes revived the name *Pomotis* of Rafinesque in precisely the same sense in which Rafinesque used it, but including several additional species. Cuvier does not credit the name *Pomotis* to Rafinesque, but, in accordance with a custom then as now too prevalent, in modifying the characters assigned to the genus, allowed his own name to supersede that of the earlier author. That Cuvier accepted the name *Pomotis* from Rafinesque is evident from the fact that he quotes Rafinesque's descriptions in a foot-note. *Pomotis* and *Bryttus* of Cuvier and Valenciennes are practically equivalent to *Po-*

*"13. *Lepomis* (Thoracique). Corps arrondi, ovale ou oblong, très comprimé. Tête et opercules écailleux, ceux-ci mutiques, le postérieur flexueux, membréux, quelquefois auriculé. Bouche petite, mâchoire à petits dents, lèvre supérieure à peine extensible. Une nageoire dorsale; nageoire thoracique à 6 rayons dont 1 épineux sans appendices. Anus au milieu. Ce genre est nombreux en espèces, je n'en connois 7 à 8 des États-Unis; son type est le *Labrus auritus* des auteurs, sous le nom duquel il y a 4 ou 5 espèces confondues. Il diffère particulièrement du *Sparus* par son opercule écailleux et le défaut d'appendice thoracique. Il se divise en deux sous-genre: 1. *Pomotis*. Corps arrondi, opercule auriculé. 2. *Apomotis*. Corps arrondi ou oblong, opercule sans auricule; mais tous ont le corps tacheté et une tache noire sur l'opercule. J'en ai découvert deux nouvelles espèces dans l'Ohio. 1. *L. cyanelus*. Corps oblong, tout couvert de points bleus, joues à lignes flexueuses bleues, opercule sans auricule; tache oblongue, queue bilobée. 2. *L. macrochirus*. Corps ovale, points bruns, point d'auricule; tache oblongue, toute noire; pectorales très longues atteignant l'anale; queue fourchée."—(RAFINESQUE.)

motis and *Apomotis* of Rafinesque. The fact that *Pomotis* has been long in use and is a very familiar name is its only claim for retention, a claim which does not appear to justify its retention in opposition to established rules of nomenclature.

The name *Pomotis* being therefore untenable for any genus of *Centrarchidæ*, Prof. Gill and myself have proposed the name *Eupomotis* for *Sparus aureus* Walbaum (= *Pomotis vulgaris* Cuvier) and its congeners.

Three species of this genus are known from autopsy to Prof. Gill and myself—*E. aureus* (Walb.), *E. speciosus* (Holbrook), and *E. pallidus* (Agassiz).

11. EUPOMOTIS PALLIDUS, (Agassiz) Gill & Jordan.

Pomotis pallidus, AG., Am. Journ. Sci. Arts, 1854, 303.—JORDAN, Man. Vert. 1876, 240.

This is a large stout species, somewhat elongate, resembling *Lepiopus pallidus* in form and coloration. Head 3 in length; depth $2\frac{3}{5}$; eye 4. Head and profile scarcely gibbous; snout protruding; mouth rather large, somewhat oblique, reaching the front of eye; eye rather large; opercular flap wide and rounded, shorter than in *E. aureus*, with a rather wide pale border, chiefly below and behind. Scales very large, 4-35-13, about 4 rows on the cheeks. Spines rather high and strong, the longest dorsal spine as long as from muzzle past middle of pupil; soft fins high; pectorals long, but not reaching anal. Gill-rakers short and weak.

Color pale olive or brassy; no trace of blue or orange in spirits; some blackish markings on last rays, but hardly a spot. Pharyngeal teeth very strongly "paved", as in the related species. Described from No. 4157, National Museum.

Habitat.—Tennessee River (Agassiz). Mississippi River, at Saint Louis; Alabama River (specimens in National Museum).

12. XENOTIS.

Xenotis, JORDAN, Proc. Acad. Nat. Sci. Phila. 1877, 76.

The peculiar character of the gill-rakers, which separates this genus from *Lepiopus*, has not yet been fully defined, and indeed a more minute study is still desirable, although it may be readily recognized. In *Lepiopus*, the gill-rakers of the anterior branchial arch are comparatively long, somewhat firm, having apparently an ossified basis, and they are provided toward their tip, on one side at least, with minute, pointed, tooth-like roughnesses. These teeth may be readily felt with the

tweezers or seen with a hand-glass. The appendages of the anterior gill-arch only are thus enlarged, those of the other arches remaining undeveloped.

In *Xenotis*, the gill-rakers are not essentially dissimilar on the different arches. They are short, comparatively thick, soft, having a cartilaginous or unossified basis, and are nearly destitute of teeth or tooth-like roughnesses. The brilliant colors, low dorsal spines, and especially the great development of the opercular flap in *Xenotis*, form additional distinctive characters, although not independently of generic value.

13. *XENOTIS SOLIS*, (*Valenciennes*) Gill & Jordan.

Pomotis solis, **VALENCIENNES* (1831), Hist. Nat. des Poissons, vii, 468. (Specimens sent by Le Sueur from near New Orleans. Those referred to from New York doubtless belong to *Lepiopomus auritus*.)

Numerous specimens of a sun-fish from the Tangipahoa River, Louisiana, have been identified by us with Valenciennes's species as above, and examples have been distributed by the United States National Museum under the name of *Xenotis solis*. Of course, it is not possible from Valenciennes's description to know certainly which one of our numerous similar species he had in mind, but it is safer to identify with the present species than with any other, and our *X. solis* does not seem ever to have received any other name.

Xenotis solis is an elongate species for the genus, most of the species of which are short and deep. It is, however, heavy forward, the region before the dorsal being quite prominent, forming a marked angle over the eye with the rising profile of the face. The greatest depth is $2\frac{1}{2}$ in the length. The head is large, 3 in length, without the opercular flap; $2\frac{1}{2}$ including the flap.

* The following is Valenciennes's description :—

Le POMOTIS SUN-FISH (Pomotis solis nob.).

Un autre pomotis du lac Pontchartrain, envoyé par M. Le Sueur, pourrait bien encore être d'une espèce distincte.

La couleur paraît d'être un jaune verdâtre uniforme, plus ou moins doré, sans aucune trace de taches ou de raies sur le corps et sur les nageoires. Le lambeau de l'oreille est plus long et plus étroit que dans aucun autre. Les nombres sont, D. 10-11 : A. 3-10, etc.

Il est long de quatre à cinq pouces.

Les Anglo-Américains de la Nouvelle-Orléans donnent à cette espèce le nom de *sun-fish* (poisson de soleil). M. Le Sueur ne nous explique pas ce qui a motivé cette dénomination.

Nous rapportons à cette espèce des individus mal colorés, qui nous ont été envoyés de New York par M. Milbert.

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The eye is quite large, 4 in the head proper; $1\frac{1}{2}$ times in the opercular flap.

The opercular flap is quite long and narrow, narrowly bordered with pale throughout its length; its length is contained about $2\frac{1}{2}$ times in the length of the rest of the head, its width is little more than half its length. It is somewhat broadened toward the tip, and is set obliquely upward and backward. Much variation in the size and form of this appendage may be expected.

The dorsal spines are moderately developed, rather high for the genus, the longest as long as from snout to middle of orbit. The caudal peduncle in this species is rather more than usually elongate: with the caudal fin it forms about one-third of the total length.

The scales on the cheek are rather large, in five or six rows. There are 39 scales in the lateral line; about five rows above and eleven below it. Fin-rays as usual, D. X, 10; A. III, 9.

The coloration has been modified by the alcohol. It seems to have been chiefly of a greenish or golden orange in life, with numerous small pale blue spots. Blue lines on the sides of the head and in front of the eyes. The fins, now unicolor, were probably largely orange in life.

This species is related to *X. inscriptus* and *X. megalotis*. It is longer-bodied and has higher spines than *fallax*, *breviceps*, *megalotis*, and *sanguinolentus*.

Its spines are much higher than in *lythrochloris* and the flap is different. *X. inscriptus*, *aureolus*, *marginatus*, and *pellastes* are smaller, less elongate, and have a different flap. In some respects it approaches nearer *Lepiopomus auritus* than do any of the above species, and specimens of the *auritus* were apparently confounded with it by Valenciennes.

14. XENOTIS SANGUINOLENTUS, (Agassiz) Jordan.

Pomotis sanguinolentus, AGASSIZ, Am. Journ. Sci. Arts, 1854, 301.

This handsome species seems to be widely distributed in the Southern States; I have seen specimens from the Tennessee, Savannah, Alabama, and Mississippi Rivers. It represents, in the South, *X. megalotis* of the Northern States. *X. sanguinolentus* may be known by the rather higher spines—the longest as long as from snout just past middle of pupil—and by a peculiarity of coloration, blue spots on the sides being arranged in vertical chain-like bands, which are striking and conspicuous even after the fish has been long in alcohol.

15. XYSTROPLITES, *gen. nov.*

This genus bears nearly the same relation to *Eupomotis* that *Lepiopus* does to *Xenotis*. It comprises those *Centrarchidae* which, wanting the supernumerary maxillary bone, have the teeth of the lower pharyngeals blunt and paved as in *Eupomotis*, and the gill-rakers long and relatively slender as in *Lepiopus*. The pharyngeal bones themselves are much narrower and smaller than in *Eupomotis*, being in form more like those of *Xenotis*. The teeth are less strongly "paved", being smaller, less crowded, and rounded rather than truncate; on the inner border of the bone are a few enlarged acute teeth. The species of *Xystroplites*, as of *Eupomotis*, have the short rounded ear-flap bordered below and behind with orange. The type is the species below described under the name of *Xystroplites gillii*. *Pomotis heros* B. & G. also belongs to this genus. The known species strongly resemble *Lepiopus pallidus* (*incisor*) in outward characters, and lack the brilliant coloration of *Eupomotis aureus*. The name *Xystroplites* is from *ξύστρον*, an instrument for scraping (gill-raker), and *οπλίτης*, armed, in allusion to the armature of the gill-rakers.

16. XYSTROPLITES GILLII, *sp. nov.*

Head $2\frac{1}{2}$ in length; depth 2; eye about equal to flap, $4\frac{1}{2}$ in head. Body elongate, very deep in the middle, abruptly narrowed each way. Greatest depth at the beginning of dorsal; a rapid slope from this point to the base of elongate caudal peduncle; a steep curve from dorsal to occiput, where an abrupt angle is formed with the projecting snout. Top of head sloping at an angle of about 45° .

Mouth wide, lower jaw a trifle longest; maxillary reaching just past the front of the pupil. Flap moderate, broad, with a very wide pale edge below and behind. Dorsal spines moderate, as long as from snout to middle of orbit; pectorals medium, barely reaching anal. Dorsal X. 10. Anal III, 9. Scales large, 6-42-13; 5 rows on the cheek.

Coloration obliterated; apparently uniform olive; traces of dusky mottlings on last rays of dorsal and anal.

Type, No. 5995, United States National Museum, from Garden Key, Florida.

This species may be known from its congener *X. heros* by the peculiar form, and from the species of *Lepiopus* by its dentition.

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17. LEPIOPOMUS ISCHYRUS, *Jordan & Nelson, sp. nov.*

Isthmis aquilensis, NELSON, Bull. Ills. Mus. Nat. Hist. i, 1876, 37 (not *Pomotis aquilensis* GRD.).

Numerous young specimens purporting to be types of Baird and Girard's *P. aquilensis* are in the National Museum. Two species seem to be represented among them, the one a *Xenotis*, the other a *Lepiopomus*. Neither of them is identical with *I. aquilensis* Nelson, and as the latter species seems not to have been hitherto named, the above appellation is proposed for it.

18. LEPIOPOMUS APIATUS, *Cope.*

Lepomis apiatus, COPE, Proc. Am. Philos. Soc. 1877. (In press.)

This is a large species related to *L. macrochirus* Raf., and more closely to *L. elongatus* (Holbr.), but stouter built than either, and with marked peculiarities of coloration.

Body deep, compressed, the form somewhat as in *Eupomotis aureus*. Profile rising rapidly from the snout; the nape swollen, forming an angle above the eye; caudal peduncle deep, not especially elongated. Mouth moderate; maxillary reaching to just past anterior margin of the eye, the lower jaw projecting somewhat when the mouth is closed. A small patch of teeth on the anterior edge of the palatines (sometimes obsolete); eye large; opercular flap short and deep, considerably shorter than the eye.

Dorsal spines high, those in the middle highest, so that a slight notch is made at the beginning of the soft rays; the soft parts of the vertical fins are largely scaly. Pectoral fins moderate, barely reaching anal. Anal spines strong, the soft rays high. Longest dorsal spine nearly equal to the distance from the snout to the posterior edge of the orbit.

Head 3 in length, the depth $1\frac{1}{2}$; eye 4 in head, larger than the opercular flap, which is short and deep.

Gill-rakers rather long, stiff, pretty strongly dentate.

Fin-rays:—D. X, 11. A. III, 10.

Scales 6-40-13, those on the cheek large, in about seven rows.

Coloration somewhat altered by the alcohol. There are no spots on the fins, and there are no traces of blue lines on the cheeks. The most marked feature of coloration is the presence on various parts of the body of little dark brown or black spots, chiefly at the base of the

scales, smaller than pins' heads, about the size of the nasal openings, and resembling fly-specks.

On the lower part of the sides of the body, these spots are most distinct, and form irregular lines along the rows of scales. They are present also on the opercular region, and are more or less appreciable on most parts of the body. On some specimens, these spots are distinct over the whole body, being enlarged on the back.

The black opercular spot is very small for the genus, no larger than in the species of *Apomotis*. Besides the black spots, there are also faint pale spots at the base of some of the scales of the sides. These were perhaps conspicuous in life.

The fins generally are rather dark, unspotted; the ventral fins are black.

The length of the specimens described is from 4 to 4½ inches.

Habitat.—St. John's River, Florida. Many specimens in the United States National Museum.

This species was indicated in MSS. some years ago by Prof. Gill, and specimens have been distributed by the Smithsonian Institution under the name *L. stercorarius* Gill. As Prof. Cope's paper will probably appear in advance of this, I have adopted his specific name, instead of publishing it as a new species.

19. LEPIOPOMUS MINIATUS, *sp. nov.*

General form of *Xenotis inscriptus*. Oblong and somewhat regularly elliptical. Head 2½ in length; depth 2½; eye large, 3½ in head; opercular flap rather short and broad, entirely black; mouth rather large; scales of cheek large, in four series; scales large, 4–40–11; palatine teeth present; gill-rakers short for *Lepiopus*, but stiff and rough. Dorsal spines rather long, as long as from snout just past middle of eye; pectorals long, reaching anal. Dorsal X, 10. Anal III, 9.

Color in spirits dark, rows of bright red or scarlet spots running lengthwise of the body; one spot on each scale, and two blackish markings on each side of the red; dorsal fin dusky behind, but unspotted; iris red. Length 4 inches.

Type, No. 16918, United States National Museum. Numerous specimens from Tangipahoa River, Louisiana. This species is perhaps most nearly related to *Lepiopus auritus*.

20. APOMOTIS PHENAX, *Cope & Jordan, sp. nov.*

Channobryttus phenax, COPE, MSS.

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depth $2\frac{1}{2}$; eye moderate, as long as snout, rather smaller than opercular flap, about $4\frac{1}{2}$ in head. Mouth moderate, the lower jaw slightly longest, the maxillary reaching middle of eye, with a strong supplemental bone; snout short, projecting, an angle over eye. Gill-rakers very long; flap larger than in the other species of the genus.

• Scales on cheek in 7 rows; on body 6-12-14. Mucous cavities strong.

Dorsal spines short and strong, as long as from snout to middle of eye; soft dorsal high, soft anal higher, both largely scaly; caudal fin emarginate; pectoral fins long, reaching anal. Dorsal X, 10. Anal III, 9.

Color in spirits uniform olive-green, paler lines along the rows of scales; soft fins somewhat mottled, but no black blotch on dorsal or anal.

This species bears much more resemblance to *Lepiopus* and *Xystroplites* than to its congeners. From *A. cyanellus*, it differs in the greater depth and compression of the body, in the longer spines, longer opercular flap, smaller mouth, and larger scales.

Type, two specimens about six inches long, in the Museum of the Philadelphia Academy of Natural Sciences, collected at Beaseley's Point, New Jersey, by Dr. Leidy.

21. ENNEACANTHUS PINNIGER, Gill & Jordan, *sp. nov.*

A very handsome species, rather larger than any other of this genus, and with larger fins.

Body rather short, deep, compressed, regularly ovate in form; the depth half the length (without caudal); the head one-third. Eye large, $3\frac{1}{2}$ in head. Mouth rather small, very oblique, the maxillary reaching to just opposite the front of the orbit.

Dorsal spines rather long, the soft rays greatly elevated; in the male fish as long as the head, reaching, when depressed, to the middle of the caudal; in the female fish considerably shorter; anal spines long, not rapidly graduated, the longest soft rays as long as those of the dorsal.

Ventral fins elongate; the filiform tips of the longest rays in the males reaching the first soft rays of the anal, the spines falling short of the anal spines. In the females, the ventral fins are shortened and scarcely reach the anal. Pectoral fins moderate, reaching the soft rays of the anal. Caudal fin elongate, nearly as long as head. Lateral line complete.

The female fish has all of the fins very much less elevated, the

longest rays of the dorsal and anal not reaching to caudal; the scales of the body more exposed, and the coloration duller.

Fin-rays:—D. IX, 10; A. III, 10. Scales 4-33-10.

The color of the male specimens in spirits is as follows:—Body olive, with, in some cases, a very faint suggestion of lateral vertical bars; a large black spot at the angle of the opercles, with pearly-blue markings about its base; an obscure bar below eye.

A number of round, luminous, or pearly-blue spots on the sides of the head, irregular in position but very distinct; other similar spots—white in spirits, doubtless sky-blue in life—on the membranes of the vertical fins, and in scattered irregular rows along the sides of the body, in some specimens on nearly the whole surface, forming imperfect lines along the sides. Each row of spots is accompanied by two faint blackish streaks. These spots are largest and most regular in position along the middle of the sides, but most definite in outline on the belly and fins.

The female is duller in color, the flap plain black, with some pale edging, and the body with larger spots, more regular in position but not so well defined. The spots on the fins are also larger and paler.

Length of largest specimens examined $3\frac{1}{2}$ inches.

Habitat.—The types were collected at Kinston, N. C., by Mr. J. W. Milner. Upward of thirty specimens were preserved.

This species seems to be the largest and handsomest of the species of *Enneacanthus*. Its relationships are most close with the next species; but it is probably the most strongly marked of the genus. The sexual distinctions, evident in all the species, are here carried to the extreme.

22. ENNEACANTHUS MARGAROTIS, Gill & Jordan, *nom. sp. nov.*

?*Enneacanthus guttatus*, COPE (1869), Journ. Acad. Nat. Sci. Phila.—(not *Pomotis guttatus* MORRIS (1859), Proc. Acad. Nat. Sci. Phila. 9, which is *E. obesus*).

Enneacanthus obesus, JORDAN (1870), Man. Vert. 232 (excl. expression "barred", copied from Prof. Baird; specimens from Trenton, N. J., supposed to be the male of *obesus*) (not *Pomotis obesus* Grd.).

?*Enneacanthus gloriosus*, UHLER & LUGGER (1876), Fishes of Maryland—(not description, which seems to be copied from Holbrook) (not *Bryttus gloriosus* Holbr.).

No description of this common little species seems ever to have been published. Dr. Morris's notice of his *Pomotis guttatus* is very superficial, and apparently refers to *E. obesus*; the only tangible feature mentioned being the presence of black bars along the sides, which this species does not have.

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The following description is taken from a large number of individuals sent by Dr. C. C. Abbott to the Smithsonian Institution from Trenton, N. J., and from others collected by Prof. Baird at Beaseley's Point, N. J.:—

Body rather short and deep, but more elongate than in any of the others; the head $2\frac{3}{4}$ in length, the depth $2\frac{1}{4}$; the eye large, longer than snout, $3\frac{1}{4}$ in head; mouth moderate, very oblique, the maxillary reaching to just past the front of the orbit.

Dorsal spines medium; the soft rays in the males somewhat elevated, reaching when depressed just to the base of the caudal; the longest soft ray as long as from the snout to the preopercular margin. In the females, the rays are shortened, but the sexual differences are much less marked than in *E. pinniger*. Anal spines long, rather rapidly graduated, the longest soft rays as long as those of the dorsal.

Ventral fins as in *E. pinniger*, the longest rays in the males filamentous and reaching the soft rays of anal; in the females shorter. Pectoral fins rather long, reaching middle of anal. Lateral line complete.

Fin-rays:—D. IX, 10; A. III, 9. Scales 3–30–9.

General coloration similar to that of *E. pinniger*. Body dark olive; very young specimens with faint traces of vertical bars; a moderate-sized opercular spot, smaller than in *E. obesus*, bordered above and below with luminous blue. Near the anterior edge of the "ear-flap" is a crescent-shaped pearly-blue spot, which, though small, is very conspicuous. Traces of a similar mark may be observed on *E. obesus*. Sides of head, whole body, and vertical fins with round bright blue spots arranged in irregular rows; these spots most distinct on the cheeks and opercles and on the lower parts of the sides.

This species resembles the preceding; but the males may be distinguished at once by the much less development of the fins and by the smaller size. The females of the two species bear more resemblance to each other, but differ in a similar way, though to a less degree.

Length of specimens examined about $2\frac{3}{4}$ inches.

Many specimens in the United States National Museum from the Potomac River, Delaware River and from localities in New Jersey.

The real affinities of *E. margarotis* are probably rather with *E. obesus*, and especially *E. gloriosus*, than with *E. pinniger*.

Bryttus fasciatus Holbrook seems to be identical with *E. obesus*.

I have seen no specimens of *E. gloriosus*, and know it only by Holbrook's description and figure.

The several species have been contrasted in the following table prepared by Dr. Gill and myself:—

- *. Dorsal and anal moderately developed in the male as well as female (extending, when declined backward, little if any beyond the base of the caudal); scales on cheek and opercles not crowded, and forming more or less distinct vertical series:
- †. Body marked with about eight well-defined dark cross-bars; opercular angle with a pretty large black spot, half or more the size of the eye; spots on body and fins purplish, red, or golden; scales large, little crowded; caudal fin moderately elongate, as long as from snout to about the middle of the opercle; lateral line usually incomplete behind OBESUS.
- ††. Body without definite cross-bars or bands; opercular spot smaller, but little larger than pupil; caudal fin short, about as long as from snout to the posterior margin of the preopercle:
- ‡. Spots on body and fins pinkish or golden; dorso-ocular profile moderately convex; interorbital space quite depressed, the protruding snout forming an angle above the eye; body rather short and deep, the depth about half-length; a small black spot at root of caudal GLORIOSUS.
- ‡‡. Spots on body and fins bright blue; dorso-ocular profile little convex, without decided concavity above orbits; body comparatively elongate, the depth less than half-length; no black caudal spot MARGAROTIS.
- **. Dorsal and anal fins much enlarged in the males (extending when declined backward as far as the middle of the caudal fin), but not in the female; scales on cheeks and opercles crowded together, forming oblique series; caudal fin very long, in the males as long as from the snout to the black opercular spot; in the females somewhat shorter; anal spines less rapidly graduated; body and fins with round pale spots, some or all of which are bright blue; lateral line complete, PINNIGER.

23. CENTRARCHUS.

Two species, at least, of the genus *Centrarchus* inhabit the waters of the Southern States, which seem to have been named by Lacépède, respectively, *Labrus macropterus* and *Labrus irideus*. *Labrus sparoides* Lacépède is also a *Centrarchus*, either identical with *L. macropterus*, or else it is a species not yet known. It is said to have ten dorsal and ten anal spines. *Centrarchus sparoides* C. & V. is apparently *C. macropterus*.

Centrarchus macropterus is a more elongate species than the common *Centrarchus irideus*. Its mouth is larger, the eye is larger, the fins are much larger, and with longer and more numerous spines. The anal fin in particular is advanced forward, so that the long spine of the ventral fin laps over on the anal as in *Copelandia*.

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3. *Ambloplites*

6. *Apomotis*, ?

7. *Lepiopomus*

8. *Xenotis*, Jo

12. *Enneacanth*

13. *Hemioplites*

The most striking differences are shown in the following comparative table of characters :—

	<i>C. macropterus</i> , (Lao.) Jor., Ocmulgee River, Ga.	<i>C. irideus</i> , (Lao.) C. & V., Coosa River, Ala., Neuse River, N. C.
Dorsal rays (usually)	XII, 12	XI, 12.
Anal rays (usually)	VIII, 14	VII, 14.
Head in length	3	3½.
Depth in length	2½	2.
Lateral line	5-43-12	5-44-14.
Ventral spine in head	1½	2½.
Ventral spine reaching	4th anal spine	Not to vent.
Longest dorsal spine in head	1½	1½.
Longest soft dorsal ray in head	1½	1½.
Longest soft anal ray in head	1½	1½.
Mandible	More than half head .	Less than half head.

The coloration in the two species appears to be essentially the same.

GENERA OF CENTRARCHIDÆ.

Prof. Gill now recognizes sixteen genera of *Centrarchidæ*, for which he suggests the following sequence, beginning with the most generalized type, *Micropterus*.

Subfamily MICROPTERINÆ, Gill.

1. *Micropterus*, Lacépède.

Subfamily LEPIOPOMINÆ, Gill.

§ 1.

2. *Chænobryttus*, Gill.

4. *Archoplites*, Gill.

3. *Ambloplites*, Raf.

5. *Acantharchus*, Gill.

§ 2.

6. *Apomotis*, Raf.

9. *Xystroplites*, Jordan.

7. *Lepiopomus*, Raf.

10. *Eupomotis*, Gill & Jordan.

8. *Xenotis*, Jordan.

§ 3.

11. *Mesogonistius*, Gill.

§ 4.

12. *Enneacanthus*, Gill.

14. *Copelandia*, Jordan.

13. *Hemioplites*, Cope.

Subfamily CENTRARCHINÆ, Gill.

15. *Centrarchus*, Cuv. & Val.16. *Pomoxys*, Raf.

The first section of the subfamily of *Lepiopominae* is distinguished by the development of an oval patch of teeth on each entopterygoid bone, as well as a continuation on each pterygoid bone of a band of teeth from the palatine bone, a character not hitherto noticed, to which Prof. Gill has called my attention. The setiform gill-rakers, reminding us of the Cichlid genus *Chaetobranchus*, form an important distinctive character of *Centrarchinae*.

ANALYSIS OF THE GENERA OF CENTRARCHIDÆ.

I include here, for the sake of comparison, the aberrant genus *Elasosoma*, whose precise affinities are as yet undetermined:—

- A. Lateral line well developed; vomerine teeth present; branchiostegals, 6; fins largely developed, with normally more than five dorsal spines (true *Centrarchidae*):
 - *. Dorsal fin much more developed than anal fin (the base of the former $1\frac{1}{2}$ to 3 times that of the latter), the soft parts of the two fins about equal, of 8 to 14 rays, and ending at the same vertical behind:
 - t. Body elongate, not greatly compressed; spines little developed, those of the anal fin, three in number, small and weak; those of the dorsal ten, the eighth and ninth quite short, so that there is a deep notch between the spinous and soft parts of the dorsal, almost breaking the continuity of the fin; caudal emarginate; operculum emarginate behind, ending in two flat points; mouth very large, the lower jaw longest; palatine teeth well developed; tongue and pterygoids toothless; gill-rakers long and stout, armed with teeth; supplemental maxillary bone well developed (*Microptera*) MICROPTERUS, 1.
 - ††. Body comparatively short and deep, compressed; anal spines well developed; dorsal with strong spines, which are continuous with the soft rays, or at least not deeply notched (*Lepiopomina*):
 - a. Tongue and pterygoid bones conspicuously armed with teeth: mouth large, lower jaw longest; maxillary bone broad and flat, with a strong supplemental ossicle behind it; palatine teeth well developed; gill-rakers long and strong, provided with coarse teeth; form stout and heavy:
 - b. Operculum emarginate behind; anal spines 5 to 7:
 - c. Caudal fin emarginate; scales ctenoid:
 - d. Tongue with two patches of teeth; anal spines normally 7; dorsal 12; gill-rakers longer, and somewhat more numerous than in the next,
 - ARCHOPLITES, 2.
 - dd. Tongue with a single median patch of teeth; anal spines normally 6; dorsal 10 or 11 AMBLOPLITES, 3.
 - cc. Caudal fin rounded behind; scales cycloid; anal spines normally 5,
 - ACANTHARCHUS, 4.
 - bb. Operculum ending behind in a convex "flap", black in color; anal spines 3; dorsal 10; caudal emarginate CHENOBRYTUS, 5.

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aa. Tongue and pterygoid bones toothless; mouth moderate or small:

d. Operculum ending behind in an entire convex process or flap, which is always more or less black; dorsal fin not notched; dorsal spines normally 10; anal spines 3, the soft rays in each about 10 in number; caudal fin emarginate:

e. Maxillary with a supplemental bone; gill-rakers long, stout, dentate; mouth rather large, the lower jaw protruding; palatine teeth present; spines low; flap small APOMOTIS, 6.

ee. Maxillary without supplemental bone; mouth rather small, with subequal jaws:

f. Lower pharyngeal bones comparatively narrow, with the teeth all conic and sharp, the outer short and small, the inner long and pointed:

g. Gill-rakers of anterior branchial arch more or less elongate, ossified, beset with small teeth (gill-rakers long and slender, beset on one side with minute teeth, no palatine teeth, subgenus *Heliopectera*;—or comparatively short and thick, with larger teeth, palatine teeth usually present, subgenus *Lepiopomus*) LEPIOPOMUS, 7.

gg. Gill-rakers undifferentiated, all short, thickish, weak, unossified, provided with but few weak teeth; no palatine teeth; opercular flap always large, often greatly developed; coloration brilliant; spines low XENOTIS, 8.

ff. Lower pharyngeal bones with the teeth or most of them rounded or truncate above, i. e., teeth paved, palatine teeth little developed, or more usually wanting:

h. Lower pharyngeals narrow, formed as in *Lepiopomus*, the teeth rounded, not truncate above; gill-rakers rather long and slender; spines rather high XYSTROPLITES, 9.

hh. Lower pharyngeals broad, concave, with large truncate teeth close together; gill-rakers short and thick, more or less strongly dentate; spines high EUPOMOTIS, 10.

dd. Operculum emarginate behind, ending in two flat points, with a dermal border; caudal fin rounded behind; gill-rakers in small number, long and strong, dentate; species of small size and brilliant coloration:

h. Dorsal fin angulated, the middle spines longer than some of the posterior ones; supplemental maxillary wanting (for rudimentary); anal spines 3; dorsal 10 MESOGONISTIUS, 11.

hh. Dorsal fin continuous; supplemental maxillary bone well developed:

i. Dorsal spines 9; anal 3 ENNEACANTHUS, 12.

ii. Dorsal spines 8; anal 4 HEMIOPLITES, 13.

iii. Dorsal spines 10; anal 4; anal fin with an elongate basis, its anterior rays being advanced COPELANDIA, 14.

"Dorsal and anal fins about equal in extent, the soft portions of the latter longest and most posterior, the two fins being obliquely opposed; lower jaw longest; supplemental maxillary bone present; palatine teeth present; operculum emarginate behind; gill-rakers setiform, very long, finely dentate, in large number (20 to 30 of the large ones on anterior branchial arch); fins large, the soft rays of the dorsal and anal each with 14 to 18 rays; caudal fin emarginate; scales not strongly ctenoid (*Centrarchinae*):

j. Spinous dorsal longer than soft part, the spines about 12 in number, not rapidly graduated; anal spines normally 8; body deep; mouth moderate.

CENTRARCHUS, 15.

jj. Spinous dorsal shorter than soft part, the spines 5 to 8 in number, rapidly graduated; anal spines normally 6; body compressed and rather elongate; mouth large POMOXYS, 16.

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AA. No lateral line; no vomerine teeth apparent; fins little developed, the dorsal with 5 spines, the anal with 3; branchiostegals apparently 5; scales cycloid; upper jaw unusually protractile; jaws with strong teeth; size small (*Elassomina*):

k. Mouth small, oblique, the lower jaw the longer; jaws with apparently one row of stout conical teeth; branchiostegal membranes broadly connected across the pectoral region; body rather elongate, compressed; caudal fin rounded; cheeks and opercles scaly.....ELASSOMA, 17.

CATALOGUE OF SPECIES OF CENTRARCHIDÆ.

I give below a catalogue of the species of *Centrarchidæ*, which appear to be valid, with their geographical distribution. Those of which I have not been able to examine specimens are indicated by a star (*). Several species, as *Lepomis ophthalmicus* Cope, *Bryttas humilis* Grd., are known only from specimens too immature for me at least to come to any certain conclusion as to their true relations.

The type-species of each genus is placed first; *d. s.* indicates doubtful species; *d. g.*, doubt as to whether placed in the proper genus.

MICROPTERUS, Lacépède.

1. *Micropterus salmoides*, (Lac.) Gill.—New England and Great Lake Region to Alabama.
2. *Micropterus pallidus*, (Raf.) Gill & Jordan.—Great Lake Region and Red River of the North to Virginia, Florida, and Mexico.

CHÆNOBRYTTUS, Gill.

3. *Chænobryttus gulosus*, (C. & V.) Gill.—Upper Great Lakes, Mississippi Valley, and Southwest.
4. *Chænobryttus viridis*, (C. & V.) Jordan.—Virginia to Florida, east of the Alleghanies.

AMBLOPLITES, Rafinesque.

5. *Ambloplites rupestris*, (Raf.) Gill.—Lake Champlain to the Saskatchewan and south to Florida and Texas. (Includes two or three geographical varieties or nascent species.)
6. *Ambloplites cavifrons*, Cope.—Virginia to North Carolina.

ARCHOPLITES, Gill.

7. *Archoplites interruptus*, (Grd.) Gill.—Streams of the Pacific Slope

ACANTHARCHUS, Gill.

8. *Acantharchus pomotis*, (Baird) Gill.—New York to South Carolina coastwise.

9. *Apomotis*
Texas.

10. *Apomotis*

11. *Apomotis*

12. *Apomotis*

13. *Lepiopus*
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14. *Lepiopus*

15. *Lepiopus*

16. *Lepiopus*

17. *Lepiopus*

18. *Lepiopus*

19. *Lepiopus*

20. *Lepiopus*

Region, M

21. *Lepiopus*

22. *Lepiopus*

23. *Lepiopus*

24. *Lepiopus*

25. *Lepiopus*

26. *Xystroplites*

27. *Xystroplites*

28. *Xystroplites*

29. *Eupomotis* au

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30. *Eupomotis* spe

31. *Eupomotis* pa

ley, Illinois,

APOMOTIS, *Rafinesque*.

9. *Apomotis cyanellus*, Raf.—Entire Mississippi Valley and streams of Texas.
10. *Apomotis *albulus*, (Grd.) Jor., *d. g.*—Texas, &c.
11. *Apomotis signifer*, (Grd.) Jor., *d. s.*—Texas, &c.
12. *Apomotis phenax*, Cope & Jordan.—New Jersey.

LEPIOPOMUS, *Rafinesque*.

13. *Lepiopomus auritus*, (L.) Raf.—Maine to Florida—exclusively east of the mountains.
14. *Lepiopomus apiatus*, Cope.—Florida.
15. *Lepiopomus miniatus*, Jordan.—Louisiana.
16. *Lepiopomus elongatus*, (Holbr.) Gill & Jor.—Florida.
17. *Lepiopomus *bombifrons*, (Ag.) Jor., *d. g.*—Tennessee River.
18. *Lepiopomus obscurus*, (Ag.) Jor.—Georgia, Alabama, Tennessee.
19. *Lepiopomus ischyru*s, Jor. & Nelson.—Illinois.
20. *Lepiopomus pallidus*, (Mit.) Gill & Jor.—New Jersey to Great Lake Region, Mississippi Valley south to Florida and Texas.
21. *Lepiopomus *mystacalis*, Cope.—Florida.
22. *Lepiopomus humilis*, (Grd.) Cope.—Texas.
23. *Lepiopomus macrochirus*, Raf.—Ohio Valley to Illinois.
24. *Lepiopomus anagallinus*, Cope.—Kentucky to Kansas.
25. *Lepiopomus oculatus*, Cope.—Upper Mississippi Valley.

XYSTROPLITES, *Jordan*.

26. *Xystroplites gillii*, Jordan.—Florida.
27. *Xystroplites heros*, (B. & G.) Jord.—Texas.
28. *Xystroplites notatus*, (Ag.) Jord.—Tennessee River.

EUPOMOTIS, *Gill & Jordan*.

29. *Eupomotis aureus*, (Walbaum) Gill & Jordan.—Upper Mississippi Valley, Great Lake Region to New England, and south to Florida east of the Alleghanies. Not found in the Mississippi Valley south of Iowa.
30. *Eupomotis speciosus*, (Holbr.) Gill.—Florida.
31. *Eupomotis pallidus*, (Ag.) Gill & Jordan.—Lower Mississippi Valley, Illinois, and south.

XENOTIS, *Jordan*.

32. *Xenotis fallax*, (B. & G.) Jordan.—Texas.
33. *Xenotis breviceps*, (B. & G.) Jordan.—Louisiana to Texas.
34. *Xenotis popii*, (Grd.) Jord., *d. s.*—Texas.
35. *Xenotis megalotis*, (Raf.) Jord.—Ohio Valley and Upper Mississippi Valley.
36. *Xenotis sanguinolentus*, (Ag.) Jord.—South Carolina to Tennessee and Louisiana.
37. *Xenotis lythrochloris*, Jordan.—Ohio Valley.
38. *Xenotis solis*, (Val.) Gill & Jor.—Louisiana.
39. *Xenotis aureolus*, Jordan.—Ohio Valley.
40. *Xenotis aquilensis*, (B. & G.) Jor., *d. g.*—Texas.
41. *Xenotis* **marginatus*, (Holbr.) Jor., *d. g.*—Florida.
42. *Xenotis peltastes*, (Cope) Jor.—Michigan to Illinois.
43. *Xenotis inscriptus*, (Ag.) Jor.—Ohio to Missouri and south.
44. *Xenotis ophthalmicus*, (Cope) Jor., *d. s., d. g.*—Roanoke River.

MESOGONISTIUS, *Gill*.

45. *Mesogonistius chaetodon*, (Baird) Gill.—New Jersey to Maryland.

ENNEACANTHUS, *Gill*.

46. *Enneacanthus obesus*, (Grd.) Gill.—Massachusetts to North Carolina.
47. *Enneacanthus margarotis*, Gill & Jordan.—New Jersey to Virginia.
48. *Enneacanthus pinniger*, Gill & Jor.—North Carolina.
49. *Enneacanthus* **gloriosus*, (Holbr.) Jordan.—Florida.
50. *Enneacanthus* **milnerianus*, Cope.—Florida.

HEMIOPLITES, *Cope*.

51. *Hemioplites simulans*, Cope.—Virginia.

COPELANDIA, *Jordan*.

52. *Copelandia eriarcha*, Jordan.—Wisconsin.

CENTRARCHUS, *Cuvier & Valenciennes*.

53. *Centrarchus irideus*, (Lacépède) C. & V.—North Carolina to Illinois and south, in lowland streams.
54. *Centrarchus macropterus*, (Lac.) Jor.—South Carolina to Alabama.

55. *Pomoxys*
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Labrus auritus, L.*Sparus aureus*, W.*Labrus macropterus*, L.*Labrus sparoides*, L.*Labrus salmoides*, L.*Labrus irideus*, L.*Micropterus dolomieu*, L.*Morone maculata*, L.*Sparus moresinus*, L.*Labrus palladius*, M.*Labrus achigan*, M.*Labrus rupestris*, L.*Sparus erythropus*, L.*Labrus appendix*, M.*Pomoxys annularis*, L.*Callinectes punctulatus*, L.*Lepomis cyanellus*, L.*Lepomis macrochirus*, L.*Labrus melanops*, L.*Labrus erythropus*, L.*Labrus aurita*, Raf.*Labrus megalotis*, L.*Lepomis pallidus*, Raf.*Lepomis trifasciatus*, L.*Lepomis flexuolaris*, L.*Lepomis salmoneus*, L.

POMOXYS, *Rafinesque*.§ *Pomoxys*.

55. *Pomoxys annularis*, Raf.—Entire Mississippi Valley south of Wisconsin and Ohio.

§ *Hyperistius*.

56. *Pomoxys nigromaculatus*, (Le S.) Girard.—Mississippi Valley, Great Lake Region, and streams of the Atlantic States from New Jersey to Florida.

LIST OF NOMINAL SPECIES OF CENTRARCHIDÆ, WITH IDENTIFICATIONS.

I give a list, in chronological order, of the species of *Centrarchidæ* hitherto described, so far as known to me, with my identification of them. Those species of which I have examined the original type are designated by a dagger (†).

Nominal species.	Date.	Identification.
<i>Labrus auritus</i> , Linné.....	1758	<i>Lepiopomus auritus</i> .
<i>Sparus aureus</i> , Walbaum.....	1792	<i>Eupomotis aureus</i> .
<i>Labrus macropterus</i> , Lacépède.....	1802	<i>Centrarchus macropterus</i> .
<i>Labrus sparoides</i> , Lac.....	1802	<i>Centrarchus macropterus</i> (†).
<i>Labrus salmoides</i> , Lac.....	1802	<i>Micropterus salmoides</i> .
<i>Labrus irideus</i> , Lac.....	1802	<i>Centrarchus irideus</i> .
<i>Micropterus dolomieu</i> , Lac.....	1802	<i>Micropterus salmoides</i> .
<i>Morone maculata</i> , Mit.....	1814	<i>Eupomotis aureus</i> .
<i>Sparus macasinus</i> , Raf.....	1814	<i>Eupomotis aureus</i> .
<i>Labrus pallidus</i> , Mit.....	1814	<i>Lepiopomus pallidus</i> .
<i>Labrus achigan</i> , Raf.....	1817	<i>Micropterus salmoides</i> .
<i>Bodianus rupestris</i> , Raf.....	1817	<i>Ambloplites rupestris</i> .
<i>Sparus erythropterus</i> , Raf.....	1818	(Erroneous.)
<i>Labrus appendix</i> , Mit.....	1818	<i>Lepiopomus pallidus</i> .
<i>Pomoxys annularis</i> , Raf.....	1818	<i>Pomoxys annularis</i> .
<i>Callinectes punctulatus</i> , Raf.....	1819	<i>Micropterus salmoides</i> .
<i>Lepomis cyanellus</i> , Raf.....	1819	<i>Apomotis cyanellus</i> .
<i>Lepomis macrochirus</i> , Raf.....	1819	<i>Lepiopomus macrochirus</i> .
<i>Ambloplites melanops</i> , Raf.....	1820	<i>Apomotis cyanellus</i> .
<i>Ambloplites erythropterus</i> , Raf.....	1820	<i>Ambloplites rupestris</i> .
<i>Ambloplites aurita</i> , Raf. (not of 1819).....	1820	<i>Xenotis lythrochloia</i> .
<i>Ambloplites megalotis</i> , Raf.....	1820	<i>Xenotis megalotis</i> .
<i>Lepomis pallida</i> , Raf.....	1820	<i>Micropterus pallidus</i> .
<i>Lepomis trifasciata</i> , Raf.....	1820	<i>Micropterus salmoides</i> .
<i>Lepomis flexuolaris</i> , Raf.....	1820	<i>Micropterus salmoides</i> .
<i>Lepomis salmonea</i> , Raf.....	1820	<i>Micropterus salmoides</i> .

Nominal species.	Date.	Identification.
<i>Lepomis notata</i> , Raf.....	1820	<i>Micropterus salmoides</i> .
<i>Lepomis ichtheloides</i> , Raf.....	1820	<i>Ambloplites rupestris</i> .
<i>Etheostoma calliura</i> , Raf.....	1820	<i>Micropterus salmoides</i> .
<i>Cichla sena</i> , Le Sueur.....	1822	<i>Ambloplites rupestris</i> .
<i>Cichla fasciata</i> , Le S.....	1822	<i>Micropterus salmoides</i> .
<i>Cichla ohioensis</i> , Le S.....	1822	<i>Micropterus salmoides</i> .
<i>Cichla floridana</i> , Le S.....	1822	<i>Micropterus pallidus</i> .
<i>Cichla minima</i> , Le S.....	1822	<i>Micropterus salmoides</i> .
<i>Huro nigricans</i> , C. & V.....	1828	<i>Micropterus pallidus</i> .
<i>Centrarchus pentacanthus</i> , C. & V.....	1829	<i>Ambloplites rupestris</i> .
<i>Cantharus nigromaculatus</i> , Le Sueur.....	1829	<i>Pomoxys nigromaculatus</i> .
<i>Pomotis vulgaris</i> , C. & V.....	1829	<i>Eupomotis aureus</i> .
<i>Pomotis gulosis</i> , C. & V.....	1829	<i>Chænobryttus gulosis</i> .
<i>Centrarchus hexacanthus</i> , C. & V.....	1831	<i>Pomoxys nigromaculatus</i> .
<i>Centrarchus viridis</i> , C. & V.....	1831	<i>Chænobryttus viridis</i> .
<i>Bryttus punctatus</i> , C. & V.....	1831	<i>Apomotis cyanellus</i> .
<i>Bryttus reticulatus</i> , C. & V.....	1831	<i>Chænobryttus viridis</i> .
<i>Bryttus unicolor</i> , C. & V.....	1831	(?)
<i>Pomotis ravenelli</i> , C. & V.....	1831	<i>Eupomotis aureus</i> .
<i>Pomotis holbrookii</i> , C. & V.....	1831	<i>Eupomotis aureus</i> .
<i>Pomotis incisus</i> , C. & V.....	1831	<i>Lepiopus pallidus</i> .
<i>Pomotis gibbosus</i> , C. & V.....	1831	<i>Lepiopus pallidus</i> .
<i>Pomotis solis</i> , C. & V.....	1831	<i>X. notis solis</i> .
<i>Pomotis catesbeii</i> , C. & V.....	1831	<i>Eupomotis aureus</i> .
<i>Cichla storeria</i> , Kirt.....	1838	<i>Pomoxys annularis</i> .
<i>Pomotis nitida</i> , Kirt.....	1841	<i>Xenotis megalotis</i> .
<i>Centrarchus obscurus</i> , De Kay.....	1842	<i>Micropterus salmoides</i> .
<i>Pomotis rubricauda</i> , Storer.....	1842	<i>Lepiopus auritus</i> .
<i>Pomotis aquilensis</i> , B. & G. †.....	1853	<i>Xenotis (?) aquilensis</i> .
<i>Pomotis breviceps</i> , B. & G. †.....	1853	<i>Xenotis breviceps</i> .
<i>Pomotis longulus</i> , B. & G. †.....	1853	<i>Apomotis cyanellus</i> .
<i>Gryates nobilis</i> , Ag.....	1854	<i>Micropterus pallidus</i> .
<i>Pomotis sanguinolentus</i> , Ag.....	1854	<i>Xenotis sanguinolentus</i> .
<i>Pomotis inscriptus</i> , Ag.....	1854	<i>Xenotis inscriptus</i> .
<i>Pomotis notatus</i> , Ag.....	1854	<i>Xystroplites (?) notatus</i> .
<i>Pomotis obscurus</i> , Ag.....	1854	<i>Lepiopus obscurus</i> .
<i>Pomotis bombifrons</i> , Ag.....	1854	<i>Lepiopus (?) bombifrons</i> .
<i>Pomotis pallidus</i> , Ag.....	1854	<i>Eupomotis pallidus</i> .
<i>Pomotis speciosus</i> , B. & G. †.....	1854	<i>Lepiopus pallidus</i> (var. ?).
<i>Pomotis fallax</i> , B. & G. †.....	1854	<i>Xenotis fallax</i> .
<i>Pomotis convexifrons</i> , B. & G. †.....	1854	<i>Xenotis fallax</i> .
<i>Pomotis nefastus</i> , B. & G.....	1854	<i>Xenotis (?) aquilensis</i> .
<i>Pomotis heros</i> , B. & G. †.....	1854	<i>Xystroplites heros</i> .

Gryates nuce
Centrarchus
Centrarchus
Pomotis obes
Pomotis elon
Pomotis spec
Pomotis marg
Bryttus fasci
Bryttus glori
Calliurus flori
Pomotis chæto
Centrarchus p
Gryates megas
Pomoxis nitidu
Calliurus mel
Calliurus diaph
Calliurus form
Calliurus micro
Calliurus muri
Bryttus albulus
Bryttus signifer
Bryttus humilis
Pomotis luna, G
Pomotis popel, G
Pomotis guttatu
Pomotis microl
Hyperlatus caro
Pomoxys brevis
Pomoxys interme
Pomoxys protaca
Bryttus oculatus
Pomotis longipl
Bryttus mincepa
Ambloplites cavi
Hemioplites sim
Lepomis ane-galli
Lepomis ardesiac
Lepomis ophthal
Lepomis gilii, Cog
Lepomis charyb
Lepomis nephelus
Lepomis purpur
Lepomis poltastes

Nominal species.	Date.	Identification.
<i>Grystes nuecensis</i> , B. & G†	1854	<i>Micropterus pallidus</i> .
<i>Centrarchus interruptus</i> , Grd. †	1854	<i>Archoplites interruptus</i> .
<i>Centrarchus maculosus</i> , Ayres	1854	<i>Archoplites interruptus</i> .
<i>Pomotis obesus</i> , Grd. †	1854	<i>Enneacanthus obesus</i> .
<i>Pomotis elongatus</i> , Holbr.	1855	<i>Lepiopus elongatus</i> .
<i>Pomotis speciosus</i> , Holbr.	1855	<i>Eupomotis speciosus</i> .
<i>Pomotis marginatus</i> , Holbr.	1855	<i>Xenotis marginatus</i> .
<i>Bryttus fasciatus</i> , Holbr.	1855	<i>Enneacanthus obesus</i> .
<i>Bryttus gloriosus</i> , Holbr.	1855	<i>Enneacanthus gloriosus</i> .
<i>Calliurus floridensis</i> , Holbr.	1855	<i>Chænobryttus viridis</i> .
<i>Pomotis chatodon</i> , Baird †	1855	<i>Mesogonistius chatodon</i> .
<i>Centrarchus pomotis</i> , Baird	1855	<i>Acantharchus pomotis</i> .
<i>Grystes megastoma</i> , Garlick	1857	<i>Micropterus pallidus</i> .
<i>Pomoxys nitidus</i> , Grd. †	1857	<i>Pomoxys annularis</i> .
<i>Calliurus melanops</i> , Grd. †	1857	<i>Chænobryttus gulosus</i> .
<i>Calliurus diaphanus</i> , Grd.	1857	<i>Apomotis cyanellus</i> .
<i>Calliurus formosus</i> , Grd. †	1857	<i>Apomotis cyanellus</i> .
<i>Calliurus microps</i> , Grd. †	1857	<i>Apomotis cyanellus</i> .
<i>Calliurus murinus</i> , Grd. †	1857	<i>Apomotis cyanellus</i> .
<i>Bryttus albulus</i> , Grd.	1857	<i>Apomotis (?) albulus</i> .
<i>Bryttus signifer</i> , Grd. †	1857	<i>Apomotis signifer</i> .
<i>Bryttus humilis</i> , Grd. †	1857	<i>Lepiopus humilis</i> .
<i>Pomotis luna</i> , Grd.	1857	<i>Lepiopus pallidus</i> .
<i>Pomotis popoi</i> , Grd. †	1858	<i>Xenotis popoi</i> .
<i>Pomotis guttatus</i> , Morris	1859	<i>Enneacanthus obesus</i> .
<i>Pomotis microlophus</i> , Gthr	1859	<i>Eupomotis speciosus</i> .
<i>Hyperistius carolinensis</i> , Gill	1864	<i>Pomoxys nigromaculatus</i> .
<i>Pomoxys breviceauda</i> , Gill †	1865	<i>Pomoxys annularis</i> .
<i>Pomoxys intermedius</i> , Gill	1865	<i>Pomoxys annularis</i> .
<i>Pomoxys protacanthus</i> , Gill	1865	<i>Pomoxys annularis</i> .
<i>Bryttus oculatus</i> , Cope†	1865	<i>Lepiopus oculatus</i> .
<i>Lepomis longispinus</i> , Cope†	1865	<i>Lepiopus pallidus</i> (var. ?).
<i>Bryttus mineopas</i> , Cope†	1865	<i>Apomotis cyanellus</i> .
<i>Ambloplites cavifrons</i> , Cope†	1869	<i>Ambloplites cavifrons</i> .
<i>Hemioplites simulans</i> , Cope†	1869	<i>Hemioplites simulans</i> .
<i>Lepomis anagallinus</i> , Cope†	1869	<i>Lepiopus anagallinus</i> .
<i>Lepomis ardesiacus</i> , Cope†	1869	<i>Lepiopus pallidus</i> (Juv.).
<i>Lepomis ophthalmicus</i> , Cope†	1869	<i>Xenotis</i> sp. ? (Juv.).
<i>Lepomis gilii</i> , Cope†	1869	<i>Chænobryttus viridis</i> .
<i>Lepomis charybdis</i> , Cope	1869	<i>Chænobryttus gulosus</i> .
<i>Lepomis nephelus</i> , Cope†	1869	<i>Lepiopus macrochirus</i> .
<i>Lepomis purpurascens</i> , Cope†	1870	<i>Lepiopus pallidus</i> (var. ?).
<i>Lepomis peltastes</i> , Cope *	1870	<i>Xenotis peltastes</i> .

Nominal species.	Date.	Identification.
<i>Dioplites treculii</i> , Le Vaillant & Bocourt.	1874	<i>Micropterus pallidus</i> (†).
<i>Dioplites variabilis</i> , (Le S.) Le V. & Boc...	1874	<i>Micropterus pallidus</i> (†).
<i>Copelandia eriarcha</i> , Jor. †	1876	<i>Copelandia eriarcha</i> .
<i>Xenotis lythrochloris</i> , Jor. †	1877	<i>Xenotis lythrochloris</i> .
<i>Xenotis aureolus</i> , Jor. †	1877	<i>Xenotis aureolus</i> .
<i>Xystroplites gillii</i> , Jor. †	1877	<i>Xystroplites gillii</i> .
<i>Lepiopus ischyus</i> , Jor. & Nels. †	1877	<i>Lepiopus ischyus</i> .
<i>Apomotis phenax</i> , Cope. & Jor. †	1877	<i>Apomotis phenax</i> .
<i>Lepiopus miniatus</i> , Jor. †	1877	<i>Lepiopus miniatus</i> .
<i>Enneacanthus pinniger</i> , Gill & Jor. †	1877	<i>Enneacanthus pinniger</i> .
<i>Enneacanthus margarotis</i> , Gill & Jor....	1877	<i>Enneacanthus margarotis</i> .
<i>Enneacanthus milnerianus</i> , Cope, MSS....	1877	<i>Enneacanthus milnerianus</i> .
<i>Lepomis apiatus</i> , Cope, MSS.	1877	<i>Lepiopus apiatus</i> .
<i>Lepomis mystacalis</i> , Cope, MSS.	1877	<i>Lepiopus mystacalis</i> .
<i>Xystroplites longimanus</i> , Cope, MSS.	1877	<i>Eupomotis speciosus</i> (†).

24. XENOTIS LYTHROCHLORIS.

Iothelis aurita, Raf., Ichthyologia ohioensis, 1820 (not *Labrus auritus* Linn.; not *Lepomis auritus* Raf., 1819).

Lepomis auritus, COPE, Journ. Acad. Nat. Sci. Phila. 1868 (not *Lepomis auritus* Gill).
Iothelis sanguinolentus, JORDAN, Man. Vert. 1876 (in part, confounded with *X. megalotis* and *X. sanguinolentus*.)

Xenotis lythrochloris, JORDAN (1877), Bull. U. S. Nat. Mus. ix, —.

This elegant species is fairly described by Rafinesque, and quite accurately by Prof. Cope, but no other writers seem to have distinguished it. It does not seem best to retain the name *auritus*. Rafinesque apparently took this species for the Linnean *auritus*, and, if so, this is simply a case of mistaken identification, and the name thus given in error should not be retained. If we suppose that Rafinesque intended to describe his *aurita* as a new species, we have the anomalous case of an author describing a new species under the specific name borne by an old species which he himself elsewhere precisely indicates as the type of his genus. In this view, which would be absurd in regard to any author other than Rafinesque, we should have two species, strongly resembling each other, in closely related genera, both bearing the same specific name, *Lepiopus auritus* and *Xenotis auritus*. This undesirable arrangement we can avoid by supposing, what is probably the fact, that Rafinesque wrongly identified his *Iothelis aurita* with *Labrus auritus* of Linnaeus. Rafinesque's *aurita* being thus without a specific name

I supply the coloration.

Xenotis l.
 body is elongate but the preopercular fin is unusu- colors are d-
X. lythrochloris green with l-
 brane of the orange-red.
 length of sn-
 cular flap, w-
 lentus, and
 cept at base.

X. megalotis
 rivers. *X. l.*
 and *Apomotis*
 often comes

Lepomis macro-
 Synopsis
Iothelis ma-
 236 (not
Xenotis aureolus,

Body oblon-
 vex, but som-
 about 2½ in le-
 head; mouth
 Fin-rays as
 in *X. lythrochl-*
 ventrals elong-
 Colors very
 adult lustrous
 golden orange
 shading into
 clear orange;
 sides in life, pe-

I supply that of *lythrochloris*, in allusion to the blood-red and pale-green coloration.

Xenotis lythrochloris needs comparison chiefly with *X. megalotis*. The body is elongate proportionally, somewhat as in the species of *Apomotis*, but the profile is quite steep. The back along the base of the dorsal fin is unusually straight, not strongly bowed as in *megalotis*. The colors are different in life; there is more red on the cheeks and fins in *X. lythrochloris*, but the ground-color of the back is a decided olive-green with blue spots. The belly, as in *megalotis*, is orange. The membrane of the soft parts of the vertical fins in *X. lythrochloris* is bright orange-red. The spines are extremely short, the longest about equal to length of snout. The most available distinctive point is in the opercular flap, which is extremely long, longer than in *megalotis* or *sanguinolentus*, and entirely black, without any trace of pale edging whatever, except at base. In *megalotis*, the flap is conspicuously edged with paler.

X. megalotis abounds most in ponds and still deep places in the rivers. *X. lythrochloris* runs up the small brooks into places where it and *Apomotis cyanellus* are the only Centrarchine inhabitants, whence it often comes to adorn the urchin's string in company with *Semotilus corporalis*, *Catostomus teres*, *Campostoma anomala*, and other "boys' fish".

25. XENOTIS AUREOLUS, Jordan.

Pomotis macrochira, KIRTLAND (1839), Bost. Journ. Nat. Hist. iii, 469.—STORER (1846), Synopsis, 298 (not *Icthelis macrochira* Raf.=*Lepomis nephelus* Cope).

Icthelis macrochira, JORDAN (1876), Bull. Buff. Nat. Hist. Sec. 92; Manual Vert. 236 (not of Raf.).

Xenotis aureolus, JORDAN (1877), Bull. ix, U. S. Nat. Mus. —

Body oblong, rather heavy forward; the forehead usually quite convex, but sometimes the profile straightish or almost concave; depth about $2\frac{1}{4}$ in length; head $2\frac{3}{8}$; eye about as large as flap in adult, 4 in head; mouth moderate; scales on cheeks rather large, in 5 or 6 rows.

Fin-rays as in related species; dorsal spines short, rather longer than in *X. lythrochloris*, but scarcely longer than snout; pectorals moderate; ventrals elongate.

Colors very clear and translucent, the young almost transparent, the adult lustrous, clear pale green above; sides with much spotting of golden orange or brassy, the spots numerous but not well defined, shading into the green; the orange predominating below; the belly clear orange; some blue spotting on sides, a purplish-red lustre on the sides in life, peculiar to this species. This disappears at death.

Soft parts of vertical fins, particularly the anal, with the membrane, clear orange; ventral fins bluish; cheeks with three broad bronze-orange bands, between which are bands of bluish-green; two bronze bands in front of eye; space beneath eye largely blue-green and iridescent.

Opercular flap not long, narrow, varying to rather wide, with a conspicuous purple margin; iris red; pupil black.

Size small. I have seen none over four inches in length.

Habitat—Ohio Valley; rather common in bayous and still places in small creeks. It occurs in company with *Xenotis lythrochloris*, and, like that species, is commonly among the treasures of the small boy as he comes back from the swimming-hole.

This species much resembles the young of *X. megalotis*, the only species with which it need be compared. *X. megalotis* is more positively and brilliantly colored; there is more blue; the spines are lower, and the scales on the cheeks smaller. *X. aureolus* is chiefly of a golden orange, and in life has a translucency of hue unlike the colors of any other species. In spirits, it becomes of a pale yellowish or white. It is probable that Kirtland's description of *Pomotis macrochira* was drawn up from a specimen of this species. It is certain, however, that Kirtland confounded two or three species under the name of *macrochira*, among them probably *Lepiopomus pallidus*. This cannot well be the species called *macrochira* by Rafinesque. I have therefore proposed the new name of *aureolus*, in allusion to its gilded coloration.

26. XENOTIS INSCRIPTUS, (Agassiz) Jor.

Pomotis inscriptus, AGASSIZ (1854), Amer. Journ. Sci. Arts, 302.

Lepomis inscriptus, COPE (1869), Journ. Acad. Nat. Sci. Phila. —.

Ichthelis inscriptus, JORDAN (1876), Manual Vert: 237.

Xenotis inscriptus, JORDAN (1876), Ann. N. Y. Lyc. Nat. Hist. —.

Body oblong, little elevated, the depth $2\frac{1}{2}$ in length; profile and dorsal outline forming a nearly uniform curve from snout to caudal peduncle; eye large, larger than in *megalotis*; mouth moderate; cheek-scale large.

Pectoral fins short, not reaching anal; dorsal spines low, but high for this genus, more developed than in any of the other species, the longest about as long as from snout to middle of pupil; ventral fins not reaching anal.

A small compact handsome species of a dark color, not at all translucent; color dark olive-green, with blue shades; cheeks with blue

lines; opercular
shorter than
other species
scales of the
like a pencil
rows of scales
only the anal
Length of
Habitat.—
White River
This species
weak gill-rakers
green coloration
flap distinguishing
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27. LEPTOCARUS

Leptocarus pallidus
Cuv. &

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distinct from *Leptocarus*

28. MICROTHERION

Lepomis pallidus,
Cuv. &

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lines; opercular flap pretty long, rather narrow, its lower margin being shorter than the upper, directed more obliquely upward than in the other species, bordered above and below with pinkish, many of the scales of the back and sides marked with a short horizontal black line like a pencil-mark, these usually forming interrupted lines along the rows of scales. These markings are often obsolete. Fins dark olive, only the anal usually with red; no black dorsal spot.

Length of specimens examined about 4 to 5 inches.

Habitat.—Tennessee River (Agassiz, Cope); Etowah River (Jordan); White River, Indiana (Jordan); Mississippi River at Cairo (Jordan).

This species may be known to be a *Xenotis* by the ear-flap and the weak gill-rakers. From the other Ohio species, its longer spines, dark green coloration, and the peculiar upward direction of the opercular flap distinguish it. The black streaks which suggested the name *inscriptus* usually disappear with death.

27. LEPIOPOMUS PALLIDUS, (Mitchill) Gill & Jordan.

Labrus pallidus, MITCHILL, 1814, = *Labrus appendix*, MITCHILL, 1818, = *Pomotis incisior*, CUV. & VAL., 1831.

We have here restored the oldest and therefore correct specific name to this species. The genus *Helioperca*, recently proposed by me for this species and its immediate relatives, does not seem sufficiently distinct from *Lepiopomus*. I therefore abandon it, for the present, at least.

28. MICROPTERUS PALLIDUS, (Rafinesque) Gill & Jordan.

Lepomis pallida, RAFINESQUE, 1820, = *Cichla floridana*, LE SUEUR, 1822, = *Huro nigricans*, C. & V., 1828.

Rafinesque's description of his *Lepomis pallida* seems to have been drawn from this species. His specific name should therefore be adopted. This change is especially desirable, as it does away with the objectionable local name *floridanus* for this widely distributed species.

PERCIDÆ.

29. STIZOSTETHIUM, Rafinesque.

The American species of this genus have been involved in considerable confusion, and no one seems to know positively whether we have

two, three, four, or five species, or how those species may be distinguished from each other, or, finally, what names any of them should bear. Having lately been enabled to examine a large number of specimens in a fresh state, through the kindness of John C. Klippart, the efficient fish commissioner of the State of Ohio, I have come to certain provisional conclusions, which I have thought it advisable to insert here.

Among the species of *Stizostethium*, there are two well-marked groups, known to our lake fishermen respectively as the "Saugers" and the "Pikes". These differ somewhat in external peculiarities of form and coloration, and strongly in the arrangement of the pyloric cæca.

In the "Pike" group, there are three pyloric cæca, long and large, subequal, and all longer than the stomach. In the "Saugers", the pyloric cæca are much shorter and smaller. There are four larger than the rest, not quite equal, and all shorter than the stomach. Besides the four larger ones, there are one, two, or three small ones. The total number is usually six, but sometimes the small ones are obsolete.

In the extreme generic subdivision which at present obtains, any such decided anatomical peculiarity may be held to indicate generic distinction. I therefore propose to consider the "Saugers" as at least subgenerically distinct from the "Pikes".

The name *Stizostedion* was proposed by Rafinesque for his *Perca salmonæa*, the "White Salmon of the Ohio". Rafinesque's description is not altogether satisfactory; but, as a certain fish of this genus is still known as the "White Salmon," at the Falls of the Ohio, it is possible to make an undoubted identification. The *Perca salmonæa* is a "Pike", and therefore the name *Stizostedion* (or rather *Stizostethium*, for the name is stated to mean "pungent throat") should be retained for the Pikes.

Since the preceding paragraphs were in type, Prof. Gill and the writer have been enabled to compare the American species of *Stizostethium* with the two inhabiting the waters of Europe, viz, *Stizostethium lucioperca* (L.) G. & J. (*Lucioperca sandra* C. & V.) and *Stizostethium volgensæ* (Pallas) G. & J. The genus divides at once into four strongly marked sections or subgenera, of which two—that typified by *S. canadense* and that by *S. volgensæ*—bear little resemblance to each other, and could be readily considered as generically distinct were not the other two sections intermediate. (1) The section typified by *S. volgensæ* in several respects approaches the genus *Perca*: it may be termed *Mimoperca* (G. & J.). (2) The Sauger group, from the development of the canine teeth, may be appropriately designated as *Cynoperca* (G. & J.).

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(3) The American Pike-perch group was called *Stizostethium* by Rafinesque, and (4) the Sardres of Europe were called nearly simultaneously *Lucioperca* by Cuvier and *Sandrus* by Stark. The *Lucioperca marina* Cuv. & Val. (*Perca labrax* Pallas), if correctly described, has apparently no affinity with the genus.

The following analysis of the characters of these groups has been compiled by Prof. Gill and myself after a rigorous comparison of the several forms. It may be stated that we have been unable to ascertain certainly the character of the pyloric cœca in *Mimoperca* and *Lucioperca*, the two specimens of each species in the National Museum being deprived of their intestines:—

*. Dorsal fins well separated, the interspace between them more than the diameter of the eye; the distance from the base of the last spine of the first dorsal and the first of the second equal to the space occupied by the last 4 to 6 spines of the first dorsal; anal fin II, 12, longer than high; second dorsal I, 17, to I, 21; spines of the second dorsal and anal closely attached to the soft rays; last dorsal spine scarcely erectile, more or less firmly bound down by the membrane; canine teeth strong (American species):

†. Soft dorsal comparatively short (its base one-fourth shorter than that of spinous dorsal) and with about 17 short rays; cheeks, opercles, and top of head more or less closely scaled; body depressed, subterete; size small; pyloric cœca forming two groups, the primary one of four, unequal, moderate, much shorter than the stomach; the secondary of few (1-3) rudimentary ones, which are sometimes atrophied CYNOPERCA.

‡. Soft dorsal rather long (one-sixth shorter than spinous dorsal), with about 20 soft rays; cheeks and upper surface of head nearly naked; body more compressed; size large; pyloric cœca three, subequal, all long (about as long as stomach),

STIZOSTETHIUM.

*. Dorsal fins approximated, connected by low membrane, the interspace much less than the diameter of the eye; the distance between the last spine of the first and the first spine of the second only equalling the base covered by the last four or fewer rays of the spinous dorsal; spines of second dorsal and anal connected with succeeding rays by loose membrane; last dorsal spine erectile; second dorsal usually I, 22 or 23; anal fin at least as high as long; body compressed; size large (European species, the body more or less distinctly transversely barred and the first dorsal with series of roundish black spots):

†. Soft dorsal considerably (one-fifth) shorter than spinous dorsal; anal fin II, 12, as long as high; canine teeth strong; "pyloric cœca 4 to 6" LUCIOPERCA.

‡. Soft dorsal somewhat longer than spinous dorsal; anal fin short and high; its length two-thirds its height; its rays II, 10; canine teeth weak, not much differentiated; body strongly compressed as in the genus *Perca*; "pyloric cœca three" (Günther) MIMOPERCA.

Of American species I know certainly three, the Wall-eyed Pike or Yellow Pike (*Stizostethium vitreum*), the Blue Pike or White Salmon (*Stizostethium salmoneum*), and the Sauger or Gray Pike (*Stizostethium griseum* or *canadense*). The "Sauger" of the Saint Lawrence, *S. canadense*, may be distinct from *S. griseum*, but at present I think it is not;

and, finally, the "Blue Pike" is possibly, but improbably, distinct from the "White Salmon".

Without further discussion, I will give the synonymy and characters of the species now recognized.

30. STIZOSTETHIUM VITREUM (Mitchill) Jordan & Copeland.

Wall-eyed Pike—Glass Eye—"Dory"—"Salmon"—Pike-perch—Doré—Okow—Horn Fish—Green Pike—Yellow Pike (female).

- Perca vitrea*, MITCHILL (1818), Supplement Am. Monthly Mag. ii, 247 (Cayuga Lake).
Stizostedion vitreum, JORDAN & COPELAND (1876), Check List N. Am. Fresh Water Fishes, Bull. Buff. Soc. Nat. Hist. 136.
Stizostethium vitreum, JORDAN (1877), Ann. N. Y. Lyc. Nat. Hist.—JORDAN (1877), in Klippart's Rept. Fish Commr. Ohio.
Lucioperca americana, CUV. & VAL. (1829), ii, 122.—RICHARDSON (1836), Fauna Bor.-Am. iii, 10.—KIRTLAND (1838), Zool. Ohio, 192; Bost. Journ. Nat. Hist. iv 237.—THOMPSON (1842), History Vt. 130.—DE KAY (1842), Zool. N. Y. Fishes, 17.—STORER (1846), Synopsis, 276.—AGASSIZ (1850), Lake Superior, 294.—JARDINE (1852), Nat. Libr. Perches, 107.—GÜNTHER (1859), Cat. Fishes, i, 74.—JORDAN (1874), Ind. Geol. Survey, 212; and of writers generally.
Stizostedion americanum, COPE (1865), Proc. Acad. Nat. Sci. Phila. 62, 85.—COPE (1870), Proc. Am. Philos. Soc. 448.—MILNER (1872-3), Rept. U. S. Fish Comm. 425.—JORDAN (1876), Man. Vert. 225.—UHLER & LUGGER (1876), Fishes of Maryland, 110.—NELSON (1876), Bull. Ills. Mus. Nat. Hist. 36.

Body elongate, rather slender and subcylindric, becoming deep with age; the depth in young of 14 inches, $4\frac{1}{2}$ to 5 in length; head long, $3\frac{3}{4}$ in length. Mouth large, the maxillary reaching beyond the pupil to posterior margin of orbit; its length $2\frac{3}{4}$ to 3 in head. Mandible a little more than half length of head; eyes large, less than in *salmonium*, shorter than snout and than preopercle, $4\frac{1}{2}$ to 5 in head. Jaws equal, or the lower slightly projecting, its sides somewhat included. Cheeks scaly, varying to nearly smooth, usually a few scales at least behind the eye. Opercle with a strong flat spine, which is sometimes bifid or trifid; no smaller ones below it. Dorsal spines high, more than half the length of head, as long as from snout past eye and $\frac{1}{2}$ to $\frac{1}{2}$ past opercle.

General color a heavy olive, varying considerably, finely mottled with brassy, the latter color forming indistinct lines, which run obliquely upward and backward along the rows of scales. Sides of head more or less vermiculated; lower jaw flesh-colored; belly and lower fin pinkish.

Spinous dorsal fin without black spots except a large jet-black blotch which involves the membrane of the last two or three spines. Second

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dorsal and caudal mottled olive and yellowish. Base of pectorals without distinct black spot.

Fin-rays:—Dorsal XII or XIII—1, 20 or 21. Anal II, 12. Lateral line with about 90 scales. Pyloric cæca long and large, subequal, three in number.

Size very large; this species reaches a length of nearly three feet and a weight of twenty or thirty pounds.

Habitat.—Upper Mississippi River, Great Lake Region and streams of the Atlantic slope, south of New England, north to the Fur Countries.

31. STIZOSTETHIUM SALMONEUM, Rafinesque.

Blue Pike (Lake Erie)—White Salmon (Ohio River).

Perca salmonea, RAF. (1818), Am. Monthly Mag. v, 354; (1820), Ich. Oh. 21.

Stizostedion salmoneum, RAF. (1820), Ich. Oh. 23.

Stizostedion salmoneum, COPE (1865), Proc. Acad. Nat. Sci. Phila. 82.—JORDAN (1876), Man. Vert. 225.—COPE (1870), Proc. Am. Philos. Soc. 449.—JORDAN & COPELAND (1876), Check List, 136.—NELSON (1876), Bull. Ills. Mus. Nat. Hist. 36.

Stizostethium salmoneum, JORDAN (1877), Ann. N. Y. Lyc. Nat. Hist. —; (1877), in Klippart's Rept. Fish Commrs. Ohio, —.

¶ *Perca nigropunctata*, RAF. (1820), Ich. Oh. 23 (very erroneous).

¶ *Pomacampeis nigropunctatus*, RAF. (1820), Ich. Oh. 23.

This species is very similar to the preceding in its technical characters, and it may prove to be merely a variety. The body is shorter, thicker, and deeper, with slenderer caudal peduncle, the diameter of which is not much greater than that of the large eye. The mouth is smaller, the maxillary not reaching quite to the posterior margin of the pupil, 3 in head; the eye is larger, its diameter equal to the length of the snout or that of the preopercle; the lower jaw is slightly included.

The dorsal spines are evidently considerably lower than in *S. vitreum*, the longest about equal to the distance from the snout to a point just short of hinder margin of orbit, about $2\frac{1}{2}$ in head.

The coloration is similar to that of *S. vitreum*, but the adult is bluer or greener, with scarcely any of the brassiness characteristic of the latter species. The coloration of the fins is darker, and there are traces of a blackish horizontal band along the dorsal in addition to the large black blotch on the hinder rays. Young specimens (from Ohio River) are more silvery, with traces of faint black bars along the back.

Fin-rays:—Dorsal XIV—1, 20. Anal II, 13. Lateral line with 95 scales. Opercular spine single, as in *S. vitreum*. Cheeks largely naked. Pyloric cæca three, large, longer than stomach, as in the preceding species.

Size much less than that of *S. vitreum*. The largest specimens seen by me were about fourteen inches in length. The accompanying figure represents the stomach and pyloric cœca of one of these.

Habitat.—Lake Erie, Ohio River, and southward to Georgia.

32. STIZOSTETHIUM (CYNOPERCA) CANADENSE, (C. H. Smith)
Jordan.

Sauger—Gray Pike—Sand Pike.

? *Lucioperca canadensis*, C. H. SMITH, MSS. (1834).—GRIFFITH's Cuvier's Animal Kingdom, x, 275.—RICHARDSON (1836), Fauna Bor.-Am. Fishes, iii, 17.—DE KAY (1842), N. Y. Fauna, Fishes, 19.—STORER (1846), Synopsis, 276.—GÜNTHER (1859), Cat. Fishes, i, 75.—JORDAN (1877), Klippart's Report, 225.

? *Stizostedion canadense*, JORDAN (1876), Man. Vert. 225.—JORDAN & COPELAND (1876), Check List, 136.

Lucioperca grisea, DE KAY (1842), N. Y. Fauna, Fishes, 19.—STORER (1846), Synopsis, 276.—GÜNTHER (1859), Cat. Fishes, i, 76.—JORDAN (1874), Ind. Geol. Surv. 212.

Stizostedion griseum, MILNER (1875), Rept. U. S. Fish Com. 1872-3.—JORDAN (1876), Man. Vert. 225.—NELSON (1876), Bull. Ills. Mus. Nat. Hist. 36.—JORDAN & COPELAND (1876), Check List, 136.

Lucioperca borea, GRD. (1857), Proc. Acad. Nat. Sci. Phila. Nov. (not Okow or Horn Fish of Richardson, which is *S. vitreum*).

Stizostedion boreus, GRD. (1858), Pac. R. R. Survey, x, 31.

Stizostedion boreum, JORDAN & COPELAND (1876), Check List,

I have never seen a specimen of the Sauger with the opercular spines exactly as represented in Smith's figure of his *canadensis*. I find, however, much variation in this respect, and I have seen specimens with 1, 2, 3, and 4 spines; and also specimens with the two sides unlike. Until it is known that there is a second species of Sauger in our waters differing from *griseum* by the constant presence of four opercular spines, it is safest to unite *griseum* and *canadense*.

The types of *Stizostedion boreus* Girard are preserved in the United States National Museum, and seem to be the common "Sauger", *S. canadense*. Part of Dr. Girard's description of this species is borrowed from Richardson, and applies to *S. vitreum*.

Body most elongated, more terete than in *Stizostethium* proper, with the back scarcely compressed, so broad that the lateral line may be seen in a view from above, the back somewhat angulated as it descends to the sides, the depth of the body $4\frac{1}{2}$ to 5 in length.

Head quite pointed, about $3\frac{1}{2}$ in length, the slope of the profile greater than in *Stizostethium*. Eye smaller, 5 to $5\frac{1}{2}$ in head in adult; mouth rather smaller, the lower jaw included; maxillary reaching to opposite posterior margin of eye.

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Opercle with a sharp flat spine, usually a smaller one below it and an obscure one above; sometimes two or three smaller ones below, often none; the position and number of these spines extremely variable. Cheeks usually closely scaled, the hinder third or less sometimes naked. Median furrow on top of head closely scaled.

Coloration paler and more translucent, the shades less blended than in the *Stizostethia*; olive-gray above, sides considerably brassy or pale orange, with much black mottling, the black gathered into several definite dark areas, the most distinct of these being opposite the second dorsal; two others fainter, at each extremity of the spinous dorsal and one at base of caudal. These blotches are irregular and diffuse, but very characteristic. Young specimens are pale orange, with broad black shades.

Spinous dorsal with two or three rows of round black spots, one of each row on the membrane between each pair of spines; no distinct blotch on posterior part of the fin; a large black blotch at base of pectorals. Second dorsal with about three rows of irregular dark spots; caudal yellowish and dusky, almost barred. Fin-rays:—dorsal XII—1, 17, varying to XIII—1, 18; anal II, 12. Lateral line with 92 to 98 scales.

Pyloric cæca 4 to 7; four of them larger than the rest, of different lengths, all small and shorter than the stomach. The usual number is six, but the two small ones are sometimes one or both absent, sometimes duplicated. Length of adult 10 to 15 inches.

Habitat.—Great Lake Region, and Upper Mississippi Rivers, also in the Ohio, where it has been introduced from the lakes, through the canals, according to the fishermen.

The different form and coloration, particularly the markings of the dorsal fin, distinguish this species at once from the *Stizostethia*. This species has, moreover, always fewer dorsal rays, more scaly cheeks, and a different armature of the operculum.

The following is a catalogue of the known species of *Stizostethium*, with references to Dr. Günther's Catalogue of the Fishes in the British Museum, vol. i:—

1. *STIZOSTETHIUM (CYNOPERCA) CANADENSE*, (Smith) Jordan.

Lucioperca canadensis, Günther, i, p. 75.

Lucioperca grisea, Günther, i, p. 76.

Lucioperca (borea), Günther, i, p. 501 (d. s.).

2. *STIZOSTETHIUM (STIZOSTETHIUM) VITREUM*, (Mitchill) Jordan & Copeland.

Lucioperca americana, Günther, i, p. 74.

Bull. N. M. No. 10—4

3. STIZOSTETHIUM (STIZOSTETHIUM) SALMONEUM, *Rafinesque*.4. STIZOSTETHIUM (LUCIOPERCA) LUCIOPERCA, (*Linnaeus*) Gill & Jordan.*Lucioperca sandra*, Günther, i, p. 75.5. STIZOSTETHIUM (MIMOPERCA) VOLGENSE, (*Pallas*) Gill & Jordan.*Lucioperca wolgensis*, Günther, i, p. 74.

ELASSOMINÆ.

33. ELASSOMA, *Jordan, gen. nov.*

In a collection of fishes lately sent to me by Prof. H. S. Reynolds, taken in the Little Red River, White County, Arkansas, I find two specimens of a curious little fish, representing a type entirely new to me, for which I would propose the above generic name (*ελασσωμα*, a being reduced or diminished).

The characters of the pharyngeal bones cannot well be ascertained on account of the small size of the specimens; I am, therefore, unable at present to definitely refer the genus to its proper family. It possibly, however, belongs to the family of *Cichlidae*, so numerously represented in the fresh waters of South America, of which but one species, *Heros cyanoguttatus* (B. & G.), has thus far been recorded from the United States.

The following are the generic characters of *Elassoma*, so far as they can be made out from the type-specimens:—

Form and to some extent aspect of *Aphododerus*, but more compressed; fins small; dorsal with five spines; anal with three; ventrals distinct, thoracic, each with one small spine and five soft rays; branchiostegals apparently five; mouth small, oblique, the lower jaw longest; each jaw apparently with a single row of large conical teeth; no vomerine teeth (?); cheeks and opercles scaly; body entirely scaly; no visible lateral line; branchiostegal membrane broadly united across the pectoral region; caudal fin truncate; vent normal.

Typical species *Elassoma zonata*, Jordan.

34. ELASSOMA ZONATA, *Jordan, sp. nov.*

Form rather elongate, compressed, especially behind; the nape rather broad and depressed, forming a straightish profile, the head narrowed forward, short but rather pointed, broadest below. Head 3 in length; depth about 3½. Eye large, greater than snout; 3 in head. Mouth

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considerably protractile, small, oblique, the maxillary scarcely reaching pupil.

Fin-rays:—Dorsal V, 7 (6 to 10; the exact number of soft rays I am unable to make out). Anal III, 6 (5 to 8); the spines of the dorsal continuous with the soft rays.

Color olive-green, finely punctulate everywhere; sides with about eleven parallel vertical bands of dark olive, about equal in width, narrower than the eye, the bands about as wide as the pale interspaces.

A roundish black spot, nearly as large as the eye, under the beginning of the spinous dorsal, just above the axis of the body, as in many South American *Cichlidæ*; soft fins faintly barred; cheeks and under parts of head profusely speckled with fine black dots, as in *Aphododerus cookianus*.

Length of each of the three specimens known just one inch. It probably grows to a somewhat larger size, but the fact that it has thus far apparently been overlooked by collectors, leads me to think that its maximum dimensions are quite small.

Habitat.—Little Red River, Arkansas; collector, Henry S. Reynolds; two specimens. Rio Brazos, Texas, a single specimen noticed in a bottle of Sunfishes in the United States National Museum, without other label than that of the locality.

This species seems to bear little relation to any of the genera of *Cichlidæ* described from South America by Dr. Günther or Professor Cope. I therefore propose to consider it as forming a distinct subfamily, and leave the matter of its relationships for future investigation.

APHODODERIDÆ.

35. ASTERNOTREMIA, Nelson, MSS., *nom. ger. nov.*

Sternotremia, NELSON, Bull. Ills. Mus. Nat. Hist. 1876.

Some objection has been made to the name *Sternotremia* on the ground that it is anatomically incorrect and misleading, the vent not being in the "sternon", as in *Aphododerus*, but entirely behind it. As the name *Sternotremia* was given through a misunderstanding of the meaning of "sternon", Mr. Nelson proposes to modify it to *Asternotremia*, which term is anatomically correct, and indicates the chief distinction between this genus and *Aphododerus*.

36. APHODODERUS COOKIANUS, Jordan.

Proc. Acad. Nat. Sci. Phila. 1877, p. 60.

Many specimens of this species are in the United States National Museum from various points in Illinois. The chief distinctive character of this species, the small size of the scales, seems to be constant.

Specimens of an *Aphododerus*, from near New Orleans, the original locality of *Aphredoderus gibbosus* Le Sueur, seem to be identical with *A. sayanus*.

The etymology of "*Aphredoderus*" is apparently *αφοδος*, excrement; *δερη*, neck. The word should therefore be spelled *Aphododerus*.

37. ASTERNOTREMIA MESOTREMA, *sp. nov.*

General form, appearance, and coloration of *Asternotremia isolepis* Nelson, but the vent not as in the latter species between the anterior bases of the ventral fins, but about an eye's diameter in front of them. Head nearly 3 times in length; depth $3\frac{1}{2}$; lateral line, 45 scales. Dorsal III, 8. Anal III, 7.

Type 9296, United States National Museum, from Georgia. Collector, Hugh M. Neisler; precise locality not indicated. Specimen $2\frac{1}{2}$ inches long, in very bad condition.

The peculiar position of the vent indicates a direct transition from the more generalized type of *Asternotremia* toward *Aphododerus*. In this species, it is about two-fifths of the distance between its normal position in the former genus and that of the latter, farther forward than in *Asternotremia isolepis*.

Since this paper was in press, I have received two more specimens which I refer to this species. They are in much better condition than the original types, and from them I am enabled to supplement and correct the original description.

Head 3 in length; depth $3\frac{1}{2}$; eye 4 in head; distance to dorsal $2\frac{1}{2}$ in body; base of dorsal 4.

Fin-rays:—D. III, 10; A. III, 6; V. 7. Scales in 60 to 70 rows, very small, and difficult to count.

Vent in front of the ventrals, about one-third the distance to the little knob at the throat.

Color precisely like that of the other members of the family.

Length of specimens $2\frac{3}{4}$ and $2\frac{1}{2}$ inches respectively. They were taken in Little Red River, Arkansas, by Prof. H. S. Reynolds.

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The species of this family now known are the following, beginning with the form least specialized :—

1. *Asternotremia isolepis* Nelson.—Illinois, both in tributaries of Lake Michigan and of the Ohio and Mississippi.
2. *Asternotremia mesotrema* Jordan.—Georgia to Arkansas.
3. *Aphododerus cookianus* Jordan.—Wabash Valley ; at various points both in Indiana and Illinois. Many specimens in United States National Museum.
4. *Aphododerus sayanus* (Gilliams) De Kay.—Streams coastwise, New York, New Jersey, south to Louisiana.

UMBRIDÆ

38. UMBRA PYGMÆA, (*De Kay*) *Bean*, MSS.

Leuciscus pygmaus, DE KAY, Fishes N. Y. 214.—STORER, Synopses, 414.

Melanura pygmæa, BAIRD, Ninth Smithsonian Rept. 1855.

Fundulus fuscus, AYRES, Bost. Journ. Nat. Hist. iv, 296.—STORER, l. c. 431.

Umbra or *Melanura limi*, part, various authors (all quotations from Southern New York and streams of the Atlantic coast).

My friend Dr. T. H. Bean, of the Smithsonian Institution, calls my attention to the fact that the Mud Minnow of our eastern streams is quite a different species from the *Umbra* or *Melanura limi*, with which it has thus far been confounded by all writers who were aware of the relations of the fish. The synonymy of *M. pygmæa* is given above. Its characters are as follows :—

Head about 4 in length ; depth $4\frac{1}{2}$; body more terete and less compressed than in *M. limi* ; head broader, less depressed, with larger eye ; interorbital space more convex ; snout shorter, profile more gibbous. Dorsal 13 ; anal 7 (dorsal 12, anal 8 in *M. limi*). Lateral line 35.

Coloration :—dark brown, a series of whitish lengthwise stripes along the rows of scales ; a black bar at base of caudal ; no traces of vertical bars ; blackish bands forward, downward, and backward from eye ; a dark vertebral band. *M. limi* is more mottled, not striped, and always shows pale vertical cross-bars. Specimens examined from Tarboro', N. C., and from points in New Jersey and New York. The smaller number of branchiostegals (four instead of five or six) is the only character known to separate *Melanura* from *Umbra*.

ESOCIDÆ.

39. ESOX NOBILIOR, Thompson.

? *Esox masquinongy*, MITCHILL, "Mirror, 1824, 297" (not there!).*

? *Esox estor*, RICHARDSON, Fauna Boreali-Americana, iii, 1836, p. 127; and of several authors (not of Le Sueur, Journ. Acad. Nat. Sci. i, 1818, 413).

Esox nobilior, THOMPSON, Proc. Bost. Soc. Nat. Hist. iii, 1850, 163, 173, 305; and of recent writers generally.

It is not quite clear why Dr. Mitchill's name for this species should be set aside. Günther remarks (Cat. Fishes Br. Mus. 1866, vi, 227), "Mitchill has counted seventeen anal rays, and therefore it is probable that his typical specimens belonged to this species (*E. lucius*) and not to *E. estor* (*nobilior*), and rejects Mitchill's name on the supposition that the number of rays in the Muskallunge is 20 or 21. But, in point of fact, the number of anal rays is 16 to 18, usually one less than in *E. lucius*", instead of 3 or 4 more. Moreover, Mitchill's specimen was about 4 feet in length and weighed 30 pounds, a size unusual for the Pike, although specimens even larger are occasionally taken. Mitchill supposed that the fish in his possession was the Muskallunge; he described it, and named it on that supposition.

The following description was taken from a specimen about 3 feet long from Ecorse, Mich. (No. 10607, National Museum), and from three smaller specimens from Lake Huron:—

Depth 6 in length; head 3½; general form of *E. lucius*, the head perhaps a trifle larger proportionally, 10 inches long in the larger specimens; eye about midway in head. Interorbital space transversely concave, with a prominent middle ridge; maxillary reaching to opposite middle of orbit.

Scaly part of cheeks about as wide as eye, beginning on a level with the eye and running backward, its lower edge nearly parallel with the profile. Scaly region of opercles similar. The amount of squamation is variable within narrow limits. Eight rows of scales on cheeks and about the same number on opercles. Scales on lateral line 150.

Fin-radial:—B. 18-17; 17-17; 18-19; 17-17, in four specimens. D. III, 17; III, 17; III, 17. Anal, II, 15; III, 14; III, 15. V. 12.

Color dark gray; sides with round dark spots of a grayish-black hue, nearly the color of the back, on a ground-color of grayish silvery;

* A search through the files of the Mirror for Mitchill's description has proved unsuccessful: it is not on the page cited by Dekay.

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* *Clupea heta*
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belly white; fins black, spotted as in *E. lucius*. Nearly every writer who has mentioned the Muskallunge has confounded it more or less with *E. lucius*. Günther's statement, "body with large rounded whitish spots," applies to *E. lucius*, and not at all to *E. nobilior*, the color in the latter species being gray, with rounded blackish spots.

I have compared European and American examples of *Esox lucius*, and am unable to find any difference whatever.

DORYSOMATIDÆ.

40. DORYSOMA CEPEDIANA, (Le S.) Gill.

Subsp. *HETERURA*, (Raf.) Jordan.

Comparison of specimens of *Dorysoma* from the Wabash River with others from Chesapeake Bay have convinced me that all properly belong to one species, but that our inland form may be recognized as a subspecies, for which the name *heterura** may be retained. Var. *heterura* differs chiefly in form; the back is much less arched, the axis of the body in specimens of about a foot in length being about half nearer the dorsal than the ventral outline. In *cepediana*, the axis of the body is usually about midway. The greater arch of the back in *cepediana* brings the beginning of the dorsal fin nearer snout than base of caudal; in *heterura*, the dorsal is about midway. The dorsal filament is usually longer in *heterura*, commonly longer than head; in *cepediana*, it is usually shorter than head. The less elevated nape renders the head of *heterura* rather more slender.

The name *Dorysoma* may as well be spelled correctly in accordance with its etymology.

CYPRINIDÆ.

GENERA OF AMERICAN CYPRINIDÆ.

The following is a semi-artificial key to the genera of American *Cyprinidæ* which I am at present able to recognize.

Algoma Grd. I refer to *Hybognathus*, as one species which I have examined, *A. amara* has the alimentary canal elongate, and no characters

* *Clupea heterurus*, RAF., Am. Monthly Mag. Sept. 1818, 354, = *Dorosoma notata*, RAF., Ich. Oh. 1820, = *Chatoëssus ellipticus*, KIRT., 1838.

have been brought forward to distinguish *Algoma*. *Oliola* Grd. seems to be equivalent to *Episema* Cope & Jordan, the dentition and position of the dorsal being the same in both. *Notropis* Raf. is revived in place of *Alburnellus*, *Notropis atherinoides* being evidently *Alburnus rubellus* Ag., or some closely related species. *Sarcidium* I unite with *Phenacobius* without hesitation, on examination of the types of each. *Photogenis* Cope I retain for the present, rather from the fact of the utter dissimilarity of the species with those of *Nototropis* than from ability to show any good distinctive characters. It is perhaps questionable whether the development of the peculiar satin-white pigment, which is found in the fins of the males in spring in every species of *Photogenis* and *Cyprinella* known in life, and in no species of any other group (except *Codoma*, a very near affine of *Cyprinella*), may not be a true generic character.

In the genera proposed by Girard, I consider the species first mentioned as the intended type, as I believe it is a known fact that Girard himself so considered it. Some species referred to certain genera will be found not to agree with the characters here given. Several such species need a reëxamination. It may be premised that the present arrangement is to be considered merely temporary, as a step from the present condition of chaos toward solid ground.

- *. Dorsal fin without a strong developed spine; ventral fins not decurrent on the abdomen; dentary bones slender, arched, and widely separated except at their symphysis; opercular and mandibular bones without externally visible cavernous chambers; pharyngeal teeth well developed:
- †. Air-bladder suspended in the abdominal cavity and surrounded by many convolutions of the long alimentary canal (*Campostomina*):
- a. Teeth in the principal row 4-4, with oblique grinding surface and no hook; mouth inferior; lips sheathed; upper lip protractile; alimentary canal six to nine times length of body; sexual differences very great; males strongly tuberculate,

CAMPOSTOMA, 1.

- ††. Air-bladder contiguous to the roof of the abdominal cavity and above the alimentary canal (*Leuciscinae*):

- ‡. Rudimentary dorsal ray separated from first developed ray by membrane; head short, mouth small, inferior; upper jaw protractile; teeth 4-4, with grinding surface, not strongly hooked; males with the head tuberculate:

- b. Alimentary canal elongate, two or three times length of body; teeth scarcely hooked; jaws normal:

- c. Lateral line incomplete.....PIMEPHALES, 2.

- cc. Lateral line complete.....HYBORHYNCHUS, 3.

- dd. Alimentary canal short, about as long as body; teeth hooked; jaws with spoon-shaped bony expansions, somewhat as in *Tetrodon*,

COCHLOGNATHUS, 4.

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##. Rudimentary dorsal ray attached :

d. Teeth not molar, in one or two rows :

e. Maxillary without barbel :

f. Teeth in the principal row 4-4 :

g. Alimentary canal elongate, about four times length of body ; teeth one-rowed, cultriform, with oblique grinding surface and little or no hook ; premaxillary projectile ; lips attenuate, without sheath ; scales large :

h. Lateral line almost wanting ; mouth oblique ; dorsal in front of ventrals COLISCUS, 5.

hh. Lateral line complete ; mouth horizontal ; dorsal over ventrals :

— Teeth elongate with narrow grinding surface and no hook ; body elongate HYBOGNATHUS, 6.

— Teeth short, with rather broad grinding surface and slight hook ; body short and rather stout ; size small DEONDA, 7.

gg. Alimentary canal short, about as long as body ; teeth raptatorial, usually strongly hooked :

i. Teeth with grinding surface developed, not crenate :

j. Dorsal fin beginning above ventrals (i. e., above some part of base of ventrals) ; anal basis short :

— Scales small, much longer than deep, with much of the surface exposed ; body stout, compressed ; teeth one-rowed, little hooked, the uppermost standing out above the surface of the bone ; size large (Subgenus ?) ALGANSEA, * 8.

— Scales large, about as long as deep, the usual surface exposed ; teeth one- or two-rowed, pretty strongly hooked ; size usually quite small (Subgenus ?) HYBORIS, 9.

— Scales large, much deeper than long on the sides, the exposed surfaces very narrow ; teeth one or two-rowed, strongly hooked ; size moderate or large LUXILUS, 10.

jj. Dorsal fin beginning entirely behind ventrals, between ventrals and anal ; anal basis elongate LYTHRURUS, 11.

kk. Teeth with the edges crenate ; dorsal fin beginning over middle or last rays of ventrals ; scales closely and smoothly imbricated ; teeth one-rowed (*Montana*) or two-rowed (*Cyprinella*),

CYPRINELLA, 12.

lll. Teeth with edges entire and without grinding surface :

k. Lips thin, normal ; lateral line complete :

l. Species of small size and weak organization, with the mouth little developed :

m. Scales comparatively thick, closely and smoothly imbricated, so that the exposed surfaces are higher than long ; dorsal fin beginning opposite between first and last ray of ventrals, rarely slightly posterior ; mouth subinferior, somewhat oblique ; males in spring developing a satin-white pigment in the tips of the vertical fins and in the skin of the abdomen ; snout tuberculate ; colors brilliant, pigmented,

(Subgenus ?) PHOTOGENIS, 13.

mm. Scales thin, much exposed ; no white satiny pigment (except in *Codoma* ?) :

* In *A. tincella*, the type of *Algansca* (*Leuciscus tincella* C. T. V., Hist. Nat. des Poissons vii, 323), the teeth are said to be 4-4. In some species referred to *Algansca*, they are 5-5. These I refer for the present to *Myloleucus*, from the type of which genus they differ in having but one row of teeth.

- n. Dorsal fin beginning entirely behind ventrals:
 o. Body short and thick; the head almost globular; the mouth small, inferior; anal basis short. (Subgenus?) CODOMA, 14.
 oo. Body elongate, with the mouth oblique, terminal, and the head more or less pointed; anal basis somewhat elongate, NOTOTROPIS, 15.
- nn. Dorsal fin beginning above some part of ventrals; aspect of *Nototropis* CLIOILA, 16.
- II. Species of large size, with the body much elongated, sub-cylindrical; the head elongated, and the mouth deeply cleft, *Esox*-like; scales not large; pharyngeal bones long and slender, the teeth slightly hooked (sometimes 4-5) (voracious species of large size and strong organization, aspect of *Gila*), PTYCHOCHEILUS, 17.
- kk. Lips thin; lateral line incomplete or wanting.... PROTOPORUS, 18.
 kkk. Lips thick, fleshy, enlarged behind; mouth small, inferior; dorsal fin beginning slightly anterior to ventrals; teeth one-rowed; lateral line complete..... PHENACOMIUS, 19.
- ff. Teeth in the principal row 4-5 or 5-5 (or 4-4 in some species referred to *Hemitremia*):
 p. Lateral line incomplete:
 q. Dorsal over ventrals; scales large; teeth with grinding surface; alimentary canal short..... HEMITREMIA, 19.
 qq. Dorsal behind ventrals; scales small:
 r. Teeth with grinding surface, one-rowed; alimentary canal long, CHROSOMUS, 20.
 rr. Teeth without grinding surface, two-rowed; alimentary canal short..... PHOXINUS, 21.
- pp. Lateral line complete:
 s. Lips normal, without cartilaginous or bony sheath:
 t. Anal basis not elongate—of 10 or fewer rays:
 u. Teeth raptatorial, entire, without grinding surface:
 v. Dorsal entirely behind ventrals; mouth large; scales small; body elongate; western species of large size with flattened head, arched back, and slender caudal peduncle (*Gila*) or eastern species of slender form and small size (*Clinostomus*) or western species of large size, intermediate in form and with the exposed surfaces of the scales broad (*Tigoma*), GILA, 22.
 vv. Dorsal over ventrals; mouth smaller; body stout and heavy, SIBOMA, 23.
- uu. Teeth not orenate, raptatorial, with grinding surface:
 w. Dorsal over ventrals; body rather stout.... MYLOLEUCUS, 24.
 ww. Dorsal entirely behind ventrals; body more elongate, compressed CHEONDA,* 25.
- tt. Anal basis elongate, of 11 to 25 rays; body much compressed; dorsal fin entirely behind ventrals; lateral line decurved, complete:
 x. Teeth one-rowed, not serrate, sharp-pointed, with masticatory surface, little hooked; base of caudal with many accessory rays; body elongate, large..... LAVINIA, 26.

* To this genus I refer at present *Tigoma pulchra*, *T. nigrescens*, and *T. gibbosa* of Girard. *Cheonda* differs from *Myloleucus* only in the more backward position of the dorsal and from *Gila* (*Tigoma*) in the presence of grinding surfaces on the teeth.

- xx. Teeth one-rowed, with grinding surface, and the edges crenate-serrate; belly sub-carinate; alimentary canal elongate, NOTEMIGONUS, 27.
- xxx. Teeth two-rowed, entire, without grinding surface; alimentary canal not elongate..... RICHARDSONIUS, 28.
- xx. Both jaws with a hard or cartilaginous brown horny plate, large and conspicuous; mouth inferior (*Chondrostomatus*):
- Teeth 5-4, club-shaped, entire, terminating in a hook, with the inner (grinding) surface obliquely cut; anal fin elongate; dorsal fin over ventrals; caudal fin with the accessory rudimentary rays very largely developed; alimentary canal elongate (?)..... ACROCHILUS, 29.
- fff. Teeth usually 6-6, compressed, lanceolate, erect, very slightly bent inward, one-rowed; body elongate; jaws even; scales small; dorsal over ventrals; basal caudal rays largely developed; lower jaw sharp-edged, with a knob at the symphysis; no pseudobranchia; intestinal canal elongate; size large... ORTHODON, 30.
- ffff. Teeth in the principal row 3-3, without grinding surface; isthmus very wide; dorsal behind ventrals..... TIAROGA, 31.
- cc. Maxillary provided with a small barbel:
- y. Premaxillaries not projectile, the skin of the lip and front continuous; teeth in the principal row 4-4, without grinding surface; scales small; dorsal behind ventrals; barbel terminal: RHINICHTHYS, 32.
- yy. Premaxillaries projectile, a groove separating the upper lip from the forehead:
- s. Teeth without grinding surface:
- a. Teeth in the principal row 4-4; barbels terminal:
- b. Dorsal behind ventrals; scales small:
- c. Lateral line incomplete..... APOCOPE, 33.
- cc. Lateral line complete..... (Subgenus?) ERITREMA, 34.
- bb. Dorsal fin over ventrals; lateral line complete..... NOCOMIS, 35.
- aa. Teeth in the principal row 4-5; barbels lateral:
- d. Dorsal fin over ventrals; scales large, equal, (Subgenus?) LEUCOSOMUS, 36.
- dd. Dorsal fin beginning over last rays of ventrals; scales smaller, crowded forward..... SEMOTILUS, 37.
- zz. Teeth with developed grinding surface:
- e. Dorsal fin behind ventrals; scales small..... AGOSIA, 38.
- ee. Dorsal fin directly over ventrals; scales large:
- f. Head compressed, rounded above..... POGONICHTHYS, 39.
- ff. Head broad, much depressed, nearly flat or concave above, resembling the head of a *Cyprinodont*..... PLATYGOBIO, 40.
- dd. Teeth molar, of the grinding type, without grooves or ridges, in three rows, the outer deciduous, 2 or 3, 2, 5-4, 2, 2 or 3; two or three of the teeth blunt and much enlarged; body elongate; head tapering:
- Angle of mouth with a barbel; upper jaw freely protractile; dorsal over ventrals..... MYLOCHILUS, 41.
- — No barbel; upper jaw not protractile; dorsal beginning behind ventrals..... MYLOPHARODON, 42.
- g. Opercular and mandibular bones with external cavernous chambers; air-bladder normal; dentary bones not united; fins without spines (*Catophori*):

- g.* Teeth hooked, without grinding surface, 4-4 in the principal row; lips normal; no barbel; intestines short; dorsal over ventrals; mouth small.....ERICYMBA, 43.
- ***. Dentary bones straight and flat, united throughout their length; mandible much contracted, incurved, tongue-like, a lobe on each side of it at base; air-bladder normal; bones of head not cavernous; fins without spines (*Exoglossinae*):
- h.* Teeth hooked, without grinding surface, 4-4 in the principal row; dorsal slightly behind beginning of ventrals; no barbel; premaxillaries not projectile.....EXOGLOSSUM, 44.
- ****. Dorsal fin with a strong spine composed of two, the posterior received into a longitudinal groove of the anterior; inner border of the ventral fins adherent to the body (*Plagopterinæ*):
- i.* Body with small scales; teeth hooked, without grinding surface, the principal row 4-4; no barbels; dorsal behind ventrals. LEPIDOMEDA, 45.
- ii. Body entirely naked; teeth hooked, without grinding surface, the principal row 4-4; no barbels; dorsal behind ventrals.....MEDA, 46.
- iii. Body entirely naked; teeth hooked, without grinding surface, the principal row 5-4; a barbel at the extremity of the maxillary; dorsal behind ventrals.....PLAGOPTERUS, 47.
- ****. Pharyngeal teeth quite rudimental, replaced by a somewhat uneven ridge of the bone (*Graodontinae*):
- j.* Dorsal fin short, without spinous ray, opposite ventrals; anal fin short; mouth small, without barbel, the upper jaw somewhat longer; alimentary canal short; scales of moderate size; lateral line complete.....GRAODUS, 48.

41. LUXILUS SELENE, *sp. nov.*

A handsome and striking species allied to *L. cornutus*, but showing a tendency toward *Hybopsis*. Head short and stout, rounded above, 4 in length, depth about the same; body much more elongate than in *cornutus*, and the head proportionally shorter; mouth oblique, terminal, lower jaw included; eye very large, 3 in head, wider than snout and than interorbital space; snout blunt, quite short.

Fin-rays:—Dorsal I, 8. Anal I, 7. Dorsal fin about midway of body over ventrals; dorsal very high; pectorals reaching two-thirds of the distance to ventrals, the latter to vent. Scales large, the exposed surfaces much less narrowed than in *cornutus*, 4-40-3, the lateral line little decurved.

Color bright steel-blue above, with a very distinct silvery band, which overlies a plumbeous shade; cheeks and belly silvery, a small, round black caudal spot, a dark vertebral line; iris white; fins unmarked.

Teeth with marked masticatory surface, 2, 4-4, 2.

Length of specimen 4 inches.

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1876, by Dr. T
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Many specimens in United States National Museum; collected near Bayfield, Wis., by J. W. Milner.

This species seems to be distinct from all the numerous varieties of *L. cornutus* which I have examined.

42. *LUXILUS ROSEUS*, *sp. nov.*

Another handsome species, related to the last, but still more *Hybopsis*-like.

Body short, thick, and stout, much as in *Hyborhynchus notatus*; head $3\frac{1}{2}$ in length, depth $4\frac{1}{2}$; head rather short, thick, bluntly rounded; mouth moderate, slightly oblique; jaws about equal, the lower shutting within the upper in closed mouth; eye large, nearly 3 in head, about equal to snout, a little less than the broad interorbital space; scales large, 5-38-5, 15 before the dorsal fin, those along the sides with the exposed surfaces somewhat narrowed, but not very decidedly so, the arrangement being about midway between that observed in *L. cornutus* and that of the colored species of *Hybopsis*, such as *H. chrosomus*, *H. rubricroceus*, &c.

Fin-rays:—Dorsal I, 8. Anal I, 7. Dorsal fin high, inserted directly over ventrals, midway between snout and caudal; pectorals not reaching ventrals the latter to vent.

Color olivaceous above; scales dark-edged, a broad plumbeous lateral band passing through eye; lips black, a dark caudal spot, a dark vertebral line; anal region dusted with black points; cheeks and belly silvery; dorsal, anal, caudal, and most of pectorals rosy red; iris, top of head, and tip of snout also red; no tubercles on the type-specimens, which are probably immature, being about $2\frac{1}{2}$ inches in length.

Teeth 2, 4-4, 2, with developed grinding surfaces.

This small species forms a transition between *Luxilus* and *Hybopsis*.

Habitat.—Notalbany River, near Tickfaw, La.; collected December, 1876, by Dr. T. H. Bean. The types are now in the United States National Museum.

43. *CYPRINELLA CALLIURA*, *sp. nov.*

Body elongated, compressed, elevated in the middle, the profile before dorsal curved, and the snout projecting, forming a decided angle. Head convex above, densely tuberculate; muzzle rather pointed, overhanging the oblique mouth. Eye 4 in head, $1\frac{1}{2}$ in muzzle, $1\frac{1}{2}$ in interorbital width. Head $4\frac{1}{2}$ in length; depth $3\frac{1}{2}$ to 4.

Fin-rays:—D. I, 8; A. I, 8; V, 8. Dorsal fin inserted slightly behind ventrals; pectorals scarcely reaching $\frac{3}{4}$ to ventrals, the latter to vent.

Scales moderately elevated, 6-44-3; lateral line strongly decurved, forming an abrupt flexure just before the ventrals,—a peculiarity usually well marked and characteristic.

Teeth 1, 4-4, 1, strongly crenate.

Color in spirits pale; sides silvery; a pretty distinct black blotch on last rays of dorsal, as in *C. analostana*; a large, distinct, black caudal spot, ovate in form, half larger than eye, and extending up on the middle rays of caudal; the coloration therefore nearly that of *Photogenis stigmaturus*.

Length $4\frac{1}{2}$ in ches.

Types, No. 6865, United States National Museum, from Black Warrior River, Alabama. Collector, Prof. Winchell. Many specimens. Other specimens from Tangipahoa River, Louisiana, are also in the collection.

The species seems to resemble *C. cercostigma* Cope most, having a similar coloration; but that species is said to possess the teeth 2, 4, and to have somewhat different proportions. Several other similarly colored species of *Photogenis* and *Cyprinella* inhabit our southwestern waters.

44. PHOTOGENIS GRANDIPPINIS, sp. nov.

Body short, much compressed; back elevated; the form generally that of a young *Notemigonus*. Depth 4 in length. Head short, $4\frac{1}{2}$ in length, pointed, flattened above; mouth large, very oblique, the jaws just equal; eye large, 3 in head, about equal to snout and to interorbital space.

Fin-rays:—Dorsal I, 8; anal I, 10 or 11. Dorsal fin entirely posterior to ventrals, midway between eye and base of caudal, the fin greatly elevated, the longest ray being a little longer than head; anal fin also greatly elevated, reaching to within one eye's diameter of base of caudal; in smaller specimens less elevated, but in all very large, larger than in any other Cyprinoid known to me.

Scales with the exposed edges very narrow, 6-35-3; 16 large scales before dorsal; lateral line much decurved.

Color disappearing in alcohol; dorsal fin with the large black blotch, found in all the species of this group, unusually large and distinct, spreading forward on the anterior rays; a distinct black caudal spot, smaller than eye and deeper than long, running up on the middle rays; sides shining plumbeous; a very distinct bright silvery band from upper half

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of eye straight to upper half of caudal, passing around the nose; below this sharply dusky; the opercles, lower half of eye, and lips in the dark band.

Teeth 1, 4-4, 1, hooked and sharp-edged.

Types, No. 9296, United States National Museum, from Georgia. Collector, Hugh M. Neisler; exact locality not specified. Numerous specimens in poor condition, showing no trace of tubercles.

Length $2\frac{1}{2}$ inches.

This small, handsome species is related to *P. pyrrhomelas* and *P. xenurus*, but needs no special comparison with either. The small size, the coloration, and immense development of the dorsal and anal fins distinguish it completely.

45. SEMOTILUS THOREAUIANUS, *sp. nov.*

Body short and rather stout, rather abruptly narrowed behind dorsal; depth $3\frac{3}{4}$ to $4\frac{1}{2}$ in length. Head short and thick, $3\frac{3}{4}$ in length, almost round in the larger specimen. Mouth large, oblique, the jaws about equal. Barbel lateral, better developed than in *S. corporalis*. Eye small, $4\frac{1}{2}$ to 5 in head, $1\frac{1}{2}$ in snout, about 2 in interorbital space, cheeks swollen; snout in a small male specimen 3 inches long, with a bilobed tubercle on each side.

Fin-rays:—Dorsal I, 8; anal I, 7. Dorsal entirely behind ventrals, its last ray over the first of anal; caudal peduncle slender; fins all short; pectorals not reaching nearly to ventrals, the latter not to vent.

Scales larger than in *S. corporalis*, not much crowded forward, 5-48-9; lateral line much decurved.

Coloration of *S. corporalis*, the black dorsal spot distinct.

Types, No. 9296, United States National Museum, from "Georgia". Collector, Hugh M. Neisler. Two specimens, the longest $3\frac{3}{4}$ inches long.

This species differs from *Semotilus corporalis* in its large scales, more backward dorsal, short head, and small size. The number of scales in the lateral line will probably always distinguish it.

This species is named in honor of the late Henry David Thoreau, of Concord, Mass., an excellent ichthyologist, one of the first to say a good word for the study of Cyprinidæ.*

*I am the wiser in respect to all knowledge, and the better qualified for all fortunes, for knowing that there is a minnow in the brook. Methinks I have need even of his sympathy and to be his fellow in a degree. . . .

I would know even the number of their fin-rays, and how many scales compose the lateral line.—(Thoreau, Essay on Nat. Hist. Mass. 1842. <Excursions, ed. 1863, p. 56.)

46. NOCOMIS MILNERI, *sp. nov.*

Form somewhat of *Semotilus corporalis*, but more terete and elongate; depth $4\frac{1}{2}$ in length. Head about the same, flattish above, with a broad snout, which projects over the large, oblique mouth; barbel very apparent. Eye large, equal to snout, $3\frac{3}{8}$ in head, $1\frac{1}{2}$ in interorbital space; dorsal beginning over last rays of ventrals, I, 8; anal I, 8.

Scales quite small, crowded forward, as in *Semotilus corporalis*, 11-68-7, or thereabouts.

Colors of *Semotilus corporalis*, but the fins unspotted; a faint black band passing around snout through eye, somewhat silvery below.

Teeth 2, 4-4, 2, without grinding surface; length 4 to 6 inches.

Types, No. 130, United States National Museum. Collected in Lake Superior, by J. W. Milner, of the United States Fish Commission, for whom the species is named.

This species may be known from *N. prothemius* Cope by the larger scales and different mouth. Specimens of the latter are in the National Museum, from Evanston, Ill. *Gobio plumbeus* Ag., I do not know; the present species appears to be different.

47. CLIOLA ARIOMMA, (Cope) Jordan.

Photogenia ariommu, Cope, Trans. Am. Phila. Soc. 1866, 378.

This species is a true *Chola* as I have defined that genus. The colored species referred by Prof. Cope and myself to *Episema*, viz, *E. callisema* and *E. pyrrhomelas*, are to be placed in *Photogenia* as defined in this paper. Their natural affinities are entirely with the latter group.

48. HYBOGNATHUS REGIUS, Girard.

Proc. Acad. Nat. Sci. Phila. 1856, 209.

This species, which has been for some time wrongly referred to *Hybopsis*, is a true *Hybognathus*, having the long intestines and cultriform pharyngeal teeth characteristic of the former genus. This fact was pointed out to me by Dr. T. H. Bean, who is now doing some very useful work in the way of verification of ascribed characters. *Hybognathus osmerinus* Cope is, so far as I can see on comparison of typical specimens, identical with *H. argyritis* Grd. *H. regius* is larger and deeper-bodied; *H. nuchalis* smaller.

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49. NOTEMIGONUS CHRYSOLEUCUS, (Mitchill) Jordan.

In the Annals of the Lyceum of Natural History of New York for the present year, I have described as new a species of the genus *Notemigonus* from the Ocmulgee River, Georgia, under the name of *Notemigonus ischanus*, the description being drawn from a large number of young specimens.

I have lately had the opportunity of examining a number of fine adult individuals of this species from the same river. Prof. Cope has also obtained specimens from the St. John's River in Florida.

This species differs from the common *Notemigonus "americanus"* of the North and West chiefly in the following respects: (a) in the much greater size of the anal fin, the number of rays ranging from I, 15, to I, 17; (b) in the greater compression of the body, which at the same time is also more elongate; (c) in the larger eye; (d) in the rather more pointed head; and (e) in the coloration, the sides of the body in adult males being more or less rosy, and the lower fins, especially the ventrals, orange, verging on blood-red at their tips.

Linnaeus's original description of his *Cyprinus americanus* is as follows (*Systema Naturæ*, ed. x, 1758, p. 321):

Americanus 4. C. pinna ani radiis . . . , cirris plurimis.

Catesb. car. 2. p. 12. t. 12.

Alburnus americanus.

Habitat in America.

In the twelfth edition, 1766, p. 530, the following is substituted:

Americanus 23. C. pinna ani radiis xviii. B. 3. D. 9. P. 16. V. 9. A. 18. C. 27.

Habitat in Carolina. D. Garden.

Corpus rutili, cæruleo-argenteum. Linea lateralis admodum arcuata versus abdomen. Cauda bifida.

From this latter description, it is evident that the fish which Linnaeus had in mind was the southern *Notemigonus ischanus*, rather than the northern so-called *americanus*, which, by the way, is not certainly known to occur in Carolina.

Wherefore the southern species, *Notemigonus ischanus* Jordan, should be known as *Notemigonus americanus*, and the species of the Northern States, Great Lake Region, and Mississippi Valley as *Notemigonus chrysoleucus*, the name of *Cyprinus chrysoleucus* Mitchill being the oldest available name applied to it so far as known to the writer.

Leuciscus boscai Cuv. & Val. is probably identical with *Notemigonus*
Bull. N. M. No. 10—5

americanus. Prof. Cope states that it is "probably a *Lavinia*", but he has not yet given us the grounds for his opinion. The figure of Cuvier and Valenciennes certainly bears little resemblance to *Lavinia*.

50. PLATYGOBIO GRACILIS, (*Richardson*) Gill & Jordan.

Cyprinus (*Leuciscus*) *gracilis*, RICHARDSON (1836), Fauna Boreali-Americana, iii, p. 120 (*Leuciscus gracilis* of copyists).

Leucosomus gracilis, HECKEL (1843), Fische Syriens, p. 52 (= Russeger's Reisen, p. 1042).

Pogonichthys communis, GIRARD (1856), Proc. Acad. Nat. Sci. Phila. p. 188, and elsewhere.

Platygobio communis, GILL (1876), Ichthyology, Capt. Simpson's Expl. p. 408, and in previous papers.

Leucosomus communis, GÜNTHER (1867), Cat. Fishes Brit. Mus. vii, p. —.

Comparison of various specimens of *Platygobio communis*, from Milk River, Montana, and elsewhere, with Richardson's description and figure of *Leuciscus gracilis*, leaves no doubt of the identity of the two species.

CATOSTOMIDÆ.

51. MYXOSTOMA PÆCILURA, *sp. nov.*

Form and general characters of *Myxostoma duquesnii*: Body rather elongate, somewhat elevated forward, moderately compressed; the greatest depth $4\frac{1}{2}$ in length; eye medium, $4\frac{1}{2}$ in length; mouth moderate; the lips plicate, rather full and subtruncate behind, as in *M. aureola*, *duquesnii*, etc.

Dorsal fin medium, of 13 developed rays; anal high, reaching when depressed considerably beyond base of caudal in one specimen, falling short in the other; pectoral fins rather long; ventrals with ten rays.

Caudal fin peculiar, strongly forked, the lower lobe in both the types being considerably longer and stronger than the upper lobe.

Scales large, 5-43-4.

Coloration of the body usual; of the fins quite unlike any other member of the genus.

Dorsal fin (in the type-specimens preserved in alcohol) chiefly red, with traces of a blackish bar about half-way up; pectorals chiefly red, whitish in front, with a large, elongate, diffuse black blotch near the middle; ventrals reddish, blackish toward their base; anal faintly reddish; the membrane black.

Upper lobe of the caudal fin red; lower lobe chiefly jet-black, except the last two developed rays and their membranes, which are abruptly

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white. This produces a peculiar feature of coloration singular in this family, resembling in some slight degree that of the Cyprinodont genus *Xiphophorus*.

Types: Two specimens, numbered 16928 in the United States National Museum; collected by Mr. Fred. Mather in the Tangipahoa River, in Louisiana. The larger specimen is 10 inches long.

HYDONTIDÆ.

52. HYODON SELENOPS, Jordan & Bean, *sp. nov.*

Three well-marked species of the genus *Hyodon* inhabit the fresh waters of the United States, viz: *Hyodon chrysopsis* Richardson, of the water-basins of the Saskatchewan and Upper Missouri; *Hyodon tergisus* Le Sueur, the common "Moon-Eye" of the Great Lake region and Upper Mississippi; and an undescribed species for which the name of *Hyodon selenops* is suggested, inhabiting the waters of the Southern States. The various synonyms, *Hyodon clodulus* Le Sueur, *Abramis smithii* Rich., *Hyodon amphiodon*, *alosoides*, *heterurus*, and *vernalis* Raf., evidently belong to the common *Hyodon tergisus*, so that the proper nomenclature of these species is a simple matter.

Hyodon selenops is distinguished from the others by the more elongate body, which is less compressed than usual, and where is less difference between the curve of the back and that of the belly anterior to the ventral fins is transversely rounded, or even almost flattened instead of being obtusely carinated as in *H. tergisus*, or sharply carinated as in *H. chrysopsis*.

So strongly do *H. selenops* and *H. chrysopsis* differ in this respect that they would be considered as belonging to different genera were not the intermediate type *H. tergisus* still extant. Prof. Gill considers that, in the interests of conciseness of expression, the modifications of structure in the group should be expressed by at least subgeneric appellations, and in this I concur with him. Prof. Gill and myself, therefore, propose the new subgeneric term *Elattonistius* (ἐλάττων, smaller; ιστιος, banner—i. e., dorsal fin) for the *Hyodon chrysopsis*, and assign the characters given in the annexed synopsis. The scales are much less closely imbricated in *H. selenops*, and the number of series is, therefore, fewer. The dorsal fin is comparatively large, and nearly as long as high in front as in *H. tergisus*, and the pectoral fins are short, as in the latter species. But the most striking difference is in the size of the eye, which is exceed-

ingly large, forming nearly half the length of the side of the head in the smaller specimen, and about two-fifths in the larger.

The type of *H. selenops* is No. 19844 in the United States National Museum, from Chattanooga, Tenn.; length 8 inches. Another is from Montgomery, Ala.; and I have seen still others from the Cumberland River.

The following analysis of the species of *Hyodon* is drawn up from numerous specimens of *H. chrysopsis* taken by Dr. Elliott Coues, naturalist of the northern boundary survey, in Quaking Ash River; from specimens of *H. tergisus* from Ohio, and from the types of *H. selenops*. It will be noticed that the characters of *H. tergisus* are exactly intermediate, corresponding with the geographical range of the species. *H. chrysopsis* and *H. selenops* are, therefore, geographical races or varieties which have become so strongly differentiated from the common type that we are able to characterize them as species:

*. Dorsal fin reduced, and with only about nine fully developed rays; abdomen sharply carinated (*Elattonistius*):

- i. Dorsal fin very small, of about nine *developed* rays (besides the two or three rudiments), the length of its longest rays half greater than the length of the base of the fin; body deep, closely compressed; the belly strongly carinated both before and behind ventrals; eye moderate (about $3\frac{1}{4}$ in head); scales rather closely imbricated, 5-58-8; pectoral fins falcate nearly as long as the head, nearly or quite reaching ventrals; anal with 30 or 31 developed rays; head $4\frac{1}{4}$ in length; depth $3\frac{1}{4}$ CHRYSOPTIS.

** Dorsal fin moderate and with eleven or twelve fully developed rays; abdomen more or less obtuse (*Hyodon*):

- i. Dorsal fin larger, of about 12 developed rays; its longest rays scarcely longer than the base of the fin; form of body intermediate; the belly in front of ventrals obtusely carinated; eye large, about 3 in head; scales medium, 5-58-8; pectoral fins decidedly shorter than head, not reaching nearly to ventrals; anal rays 28 or 29; head $4\frac{1}{4}$ in length, the depth about 3 TERGISUS.
- †† Dorsal fin moderate, of 11 or 12 developed rays, nearly as long as high in front; body elongate, not greatly compressed; the belly in front of ventrals transversely rounded, not carinated; eye very large, about $2\frac{1}{4}$ in head; scales loosely imbricated, 4-50-7; pectoral fins considerably shorter than head, not reaching nearly to ventrals; anal rays 27; head $4\frac{1}{4}$ in length; depth about 4 SELENOPTIS.

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B.--SYNOPSIS OF THE FRESH-WATER SILURIDÆ OF THE UNITED STATES.

The nomenclature of the *Siluridæ* of our fresh waters has been for a long time in a very unsettled state, owing to the accumulation in our descriptive works of a large number of nominal species, and to the general lack of sharp characterizations in the published descriptions.

The writer has attempted to go over the subject critically, with a view to ascertaining the basis on which each species rests, and to eliminating all those whose claims to recognition are doubtful. I have accordingly considered every nominal species as invalid, unless either from the description itself or from the examination of specimens, some differences apparently permanent could be appreciated. Some species not here recognized will doubtless prove valid, but at least nine-tenths of those not admitted are simply spurious, either based on individual peculiarities of specimens, or more often on ignorance of species previously described.

This paper is based primarily on the collections in the United States National Museum. The writer has also examined most of the specimens of *Siluridæ* preserved in the Museum of the Academy of Natural Sciences at Philadelphia. Most of the species here recorded are also in the author's own collection, deposited in the Museum of Butler University at Indianapolis, Ind.

The drawings accompanying this paper were nearly all made by Mr. Ernest R. Copeland from specimens in the author's collection. Those of *Amiurus nigrilabris*, *Amiurus missillensis*, and *Amiurus niveiventris* were drawn by Miss Belle Sherman from Prof. Cope's types in the Museum of the Academy. A few others were drawn by Mr. Todd from specimens in the National Museum. These drawings are to be considered rather as illustrative diagrams than as pictures. They are drawn with a view to showing especially those characters which I consider to be specific in our *Siluridæ*, viz, the general outline, the position of the dorsal fin, the size, number of rays, and position of the anal fin, the form of the caudal fin, and the size and form of the pectoral spines. These features

have in all cases been drawn with considerable care and regard to accuracy.

The writer is under great obligations to Prof. Theodore Gill, of the Smithsonian Institution, for aid of various kinds, both in his work on the *Siluridæ* and in the prosecution of his ichthyological studies generally.

In the following descriptions, the "length of the body" is always measured along the sides from the snout to the middle of the *base* of the caudal fin.

All of our species of fresh water *Siluridæ* belong to the group called, by Dr. Gill, in 1862, ICTALURI. In 1864, Dr. Günther recognized the same group; but "to show his originality", as Prof. Agassiz used to say, he, without assigned reason, changed the name to *Amiurina*.

The following are the characters ascribed by Prof. Gill to the *Ictaluri* (Report on Ichthyology, Captain Simpson's Explorations across the Great Basin of Utah in 1859, p. 416).

GROUP ICHTHÆLURI.

The body is more or less elongated, compressed posteriorly, and terminating in a well-developed caudal fin. The skin is naked and unprovided with sucking cups.

The head in profile presents the appearance of a more or less elongated cone, and is covered with a skin which is generally quite thick. It is more or less flattened, and broad above, and gradually becomes narrowed to the convex snout. There is never a casque, or helmet. The supraoccipital terminates in a point.

There are eight barbels: the two maxillary, constant in the family; a pair in front of the posterior nasal apertures; and two pairs arranged in a curved line behind the lower jaw.

The nostrils form nearly a transverse parallelogram between the intermaxillaries and the eyes; the anterior are suboval or subcircular, and the posterior linear, with a raised margin, from the front of which the upper barbels originate.

The eyes are generally placed in the anterior half of the head.

The branchial apertures are ample, continued from the supero-posterior angles of the opercula to beneath the throat.

The group of *Ichthæluri* consists of four genera: *Ichthælurus*, *Amiurus*, *Pelodichthys*, and *Noturus*. All the species known to be genuine members of this group are North American, and all are included in the

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following synopsis. A Chinese species, *Pimelodus cantonensis*, referred by Dr. Günther to *Amiurus*, is excluded, as its real position is perhaps uncertain. The species are most abundant in the Mississippi Valley and Great Lake Region. Some of them occur in all our waters east of the Rocky Mountains, but as yet none are known from the Pacific Slope.

ANALYSIS OF THE GENERA OF ICHTHÆLURI.

- *. Adipose fin with its posterior margin free, not connected with the caudal fin :
 - †. Intermaxillary band of teeth convex in front, abruptly truncate behind, without lateral backward processes; branchiostegals 8 or 9 (rarely 10 or 11); ventral fins normally with 8 rays :
 - ‡. Supraoccipital bone prolonged backward, its apex emarginate, receiving the pointed anterior end of the second interspinal, thus forming a continuous bony bridge from the snout to the base of the dorsal; branchiostegals 8 or 9; head elongate; mouth small, terminal, the upper jaw the longer; anal fin elongate, of 24 to 34 rays; caudal fin furcate; body elongate, more or less slender, silvery, covered with thin skin. ICHTHÆLURUS.
 - ‡‡. Supraoccipital bone free behind, not connected with the interspinal; branchiostegals normally 9 (varying from 8 to 11); head broad; mouth broad, terminal; anal fin moderate or rather long, with 15 to 27 rays; caudal fin usually truncate, but often more or less deeply emarginate or even forked; body usually more or less shortened, covered with a rather thick skin. AMIURUS.
 - ††. Intermaxillary band of teeth convex in front, with a lateral backward extension on each side; branchiostegals normally 12; supraoccipital bone free behind; head long, broad, and flat; mouth large, the lower jaw always the longer; anal fin short, of 12 to 14 rays; ventrals with 9 rays; caudal fin truncate, its numerous rudimentary rays recurrent above and below the caudal peduncle; number of vertebrae increased; body elongate, covered with thick skin. PELODICHTHYS.
 - ** Adipose fin long and low, keel-like, adnate to the back, more or less perfectly continuous with the caudal fin; supraoccipital bone free behind; branchiostegals 9; anal fin short, with 11 to 20 rays; caudal fin rounded, with numerous rudimentary rays recurrent on the caudal peduncle; ventral rays usually 9; form various, but body usually more or less elongate, depressed in front, compressed behind, covered with a thickish but semi-transparent skin; size small, NOTURUS.

CATALOGUE OF NOMINAL SPECIES, WITH IDENTIFICATIONS.

In the following list are given, in chronological order, the names thus far proposed for our fresh-water *Siluridae*. In the right-hand column is my identification of each species. Those species of which I have examined the original types are designated by a star (*).

Nominal species.	Date.	Identification.
<i>Silurus catus</i> , L.	1758	<i>Amiurus catus</i> .
<i>Silurus gyrimus</i> , Mit.	1817	<i>Noturus gyrimus</i> .
<i>Silurus punctatus</i> , Raf.	1818	<i>Ichthælurus punctatus</i> .
<i>Silurus olivaris</i> , Raf.	1818	<i>Pelodichthys olivaris</i> .
<i>Noturus flavus</i> , Raf.	1818	<i>Noturus flavus</i> .

Nominal species.	Date.	Identification.
<i>Pimelodus albidus</i> , Le Sueur	1819	<i>Amiurus albidus</i> .
<i>Pimelodus nebulosus</i> , Le S	1819	<i>Amiurus catus</i> .
<i>Pimelodus ænens</i> , Le S	1819	<i>Pelodichthys olivaris</i> .
<i>Pimelodus caudafurcatus</i> , Le S	1819	<i>Ichthæurus punctatus</i> .
<i>Pimelodus nigricans</i> , Le S	1819	<i>Amiurus nigricans</i> .
<i>Pimelodus natalis</i> , Le S	1819	<i>Amiurus natalis</i> .
<i>Noturus luteus</i> , Raf	1819	<i>Noturus flavus</i> .
<i>Pilodictis limosus</i> , Raf	1819	<i>Pelodichthys olivaris</i> .
<i>Silurus maculatus</i> , Raf	1820	<i>Ichthæurus punctatus</i> .
Var. <i>erythroptera</i> , Raf	1820	<i>Ichthæurus punctatus</i> .
<i>Silurus pallidus</i> , Raf	1820	<i>Ichthæurus punctatus</i> .
Var. <i>marginatus</i> , Raf	1820	<i>Ichthæurus punctatus</i> .
Var. <i>lateralis</i> , Raf	1820	<i>Ichthæurus punctatus</i> .
Var. <i>leucoptera</i> , Raf	1820	<i>Ichthæurus punctatus</i> .
<i>Silurus ceruleus</i> , Raf	1820	<i>Ichthæurus punctatus</i> .
Var. <i>melanurus</i> , Raf	1820	<i>Ichthæurus punctatus</i> .
<i>Silurus argentinus</i> , Raf	1820	<i>Ichthæurus punctatus</i> .
<i>Silurus nebulosus</i> , Raf	1820	<i>Pelodichthys olivaris</i> .
<i>Silurus viscosus</i> , Raf	1820	<i>Pelodichthys olivaris</i> .
<i>Silurus lividus</i> , Raf	1820	<i>Amiurus natalis lividus</i> .
Var. <i>fuscatus</i> , Raf	1820	<i>Amiurus natalis lividus</i> .
<i>Silurus melas</i> , Raf	1820	<i>Amiurus melas</i> .
<i>Silurus cupreus</i> , Raf	1820	<i>Amiurus lividus cupreus</i> .
<i>Silurus xanthocephalus</i> , Raf	1820	<i>Amiurus xanthocephalus</i> .
<i>Silurus limosus</i> , Raf	1820	<i>Pelodichthys olivaris</i> .
<i>Pimelodus argyrus</i> , Raf	1820	<i>Ichthæurus punctatus</i> .
<i>Pimelodus lutescens</i> , Raf	1832	<i>Pelodichthys olivaris</i> .
<i>Pimelodus insigne</i> , Rich	1836	<i>Noturus insignis</i> .
<i>Silurus</i> (<i>Pimelodus</i>) <i>cænosus</i> , Rich	1836	<i>Amiurus natalis cænosus</i> .
<i>Silurus</i> (<i>Pimelodus</i>) <i>nigrescens</i> , Rich	1836	<i>Amiurus nigricans</i> .
<i>Silurus</i> (<i>Pimelodus</i>) <i>borealis</i> , Rich	1836	<i>Amiurus borealis</i> .
<i>Pimelodus punctulatus</i> , Cuv. & Val	1840	<i>Pelodichthys olivaris</i> .
<i>Pimelodus furcatus</i> , Cuv. & Val	1840	<i>Ichthæurus furcatus</i> .
<i>Pimelodus furcifer</i> , Cuv. & Val	1840	<i>Ichthæurus punctatus</i> .
<i>Pimelodus lemniscatus</i> , Le Sueur	1840	<i>Noturus insignis</i> .
<i>Pimelodus vulgaris</i> , Thompson	1842	<i>Amiurus vulgaris</i> .
<i>Pimelodus pullus</i> , De Kay	1842	<i>Amiurus pullus</i> .
<i>Pimelodus atrarius</i> , De Kay	1842	<i>Amiurus catus</i> .
<i>Pimelodus fells</i> , Agassiz	1850	<i>Amiurus catus</i> .
<i>Pimelodus gracilis</i> , Hough*	1852	<i>Ichthæurus punctatus</i> .
<i>Pimelodus marmoratus</i> , Holbrook*	1855	<i>Amiurus marmoratus</i> .
<i>Pimelodus vulpes</i> , Grd.*	1858	<i>Ichthæurus punctatus</i> .
<i>Pimelodus catulus</i> , Grd.*	1858	<i>Amiurus melas</i> .

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Amiurus obese
Noturus occide
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Noturus platyc
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Amiurus mispil
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Noturus exilis
Noturus leptac
Amiurus branu
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Amiurus ereber
Amiurus natalis
Noturus alalis, J

Nominal species.	Date.	Identification.
<i>Pimelodus felinus</i> , Grd.*	1858	<i>Amiurus natalis lividus</i> .
<i>Pimelodus antoniensis</i> , Grd.*	1858	<i>Amiurus natalis antoniensis</i> .
<i>Pimelodus aillurus</i> , Grd.*	1858	<i>Amiurus vulgaris ælurus</i> .
<i>Pimelodus lupus</i> , Grd.*	1858	<i>Amiurus lupus</i> .
<i>Pimelodus olivaceus</i> , Grd.*	1858	<i>Ichthælurus punctatus</i> .
<i>Pimelodus affinis</i> , Grd.*	1859	<i>Ichthælurus furcatus</i> .
<i>Synechoglanis beadlei</i> , Gill*	1859	<i>Ichthælurus punctatus</i> .
<i>Pimelodus houghi</i> , Grd.*	1859	<i>Ichthælurus punctatus</i> .
<i>Pimelodus boyi</i> , Grd.*	1859	<i>Amiurus catus</i> .
<i>Pimelodus confinis</i> , Grd.*	1859	<i>Amiurus melas</i> .
<i>Pimelodus cupreoides</i> , Grd.*	1859	<i>Amiurus natalis lividus</i> .
<i>Pimelodus dekayi</i> , Grd.	1859	<i>Amiurus vulgaris</i> .
<i>Pimelodus lynx</i> , Grd.*	1859	<i>Amiurus albidus</i> .
<i>Pimelodus puma</i> , Grd.*	1859	<i>Amiurus natalis</i> .
<i>Pimelodus vulpeculus</i> , Grd.*	1859	<i>Amiurus catus</i> .
<i>Pimelodus platycephalus</i> , Grd.*	1859	<i>Amiurus platycephalus</i> .
<i>Pimelodus megalops</i> , Grd.*	1859	<i>Ichthælurus punctatus</i> .
<i>Pimelodus graciosus</i> , Grd.*	1859	<i>Ichthælurus punctatus</i> .
<i>Pimelodus hammondi</i> , Abbott	1860	<i>Ichthælurus punctatus</i> .
<i>Pimelodus notatus</i> , Abbott	1860	<i>Ichthælurus punctatus</i> .
<i>Ictalurus simpsoni</i> , Gill*	1861	<i>Ichthælurus punctatus</i> .
<i>Amiurus obesus</i> , Gill*	1861	<i>Amiurus melas</i> .
<i>Noturus occidentalis</i> , Gill*	1861	<i>Noturus flavus</i> .
<i>Amiurus meridionalis</i> , Günther	1864	<i>Ichthælurus meridionalis</i> .
<i>Noturus platycephalus</i> , Gthr	1864	<i>Noturus flavus</i> .
<i>Gronias nigrilabris</i> , Cope*	1864	<i>Amiurus nigrilabris</i> .
<i>Noturus marginatus</i> , Baird*	1869	<i>Noturus insignis</i> .
<i>Ictalurus keviniskii</i> , Stauffer	1869	<i>Amiurus albidus</i> .
<i>Ictalurus macaskeyi</i> , Stauffer	1869	<i>Amiurus albidus</i> .
<i>Amiurus missilliensis</i> , Cope	1870	<i>Amiurus catus (missilliensis)</i> .
<i>Amiurus lophius</i> , Cope	1870	<i>Amiurus lophius</i> .
<i>Amiurus niveiventris</i> , Cope	1870	<i>Amiurus niveiventris</i> .
<i>Noturus exilis</i> , Nelson*	1876	<i>Noturus exilis</i> .
<i>Noturus leptacanthus</i> , Jordan*	1877	<i>Noturus leptacanthus</i> .
<i>Amiurus brannensis</i> , Jordan*	1877	<i>Amiurus brannensis</i> .
<i>Noturus miurus</i> , Jordan*	1877	<i>Noturus miurus</i> .
<i>Noturus eleutherus</i> , Jordan	1877	<i>Noturus eleutherus</i> .
<i>Ichthælurus robustus</i> , Jordan*	1877	<i>Ichthælurus robustus</i> .
<i>Amiurus erebennus</i> , Jordan*	1877	<i>Amiurus erebennus</i> .
<i>Amiurus natalis analis</i> , Jordan	1877	<i>Amiurus natalis analis</i> .
<i>Noturus sialis</i> , Jordan	1877	<i>Noturus sialis</i> .

GENUS ICHTHÆLURUS,* (*Rafinesque*) Gill.

Ictalurus, RAFINESQUE (1820), *Ichthyologia Ohnensis*, 61.

Elliope, RAFINESQUE (1820), *Ichthyologia Ohnensis*, 62.

Synechoglanis, GILL (1859), *Annals Lyc. Nat. Hist.* vii, 39.

Ictalurus, GILL (1862), *Proc. Boston Soc. Nat. Hist.* 41.

Ichthæurus, COPE (1869), *Journ. Acad. Nat. Sci. Phila.* 237.

ETYMOLOGY.—*ιχθυς*, fish; *αιλουρος*, cat.

TYPE.—*Silurus punctatus*, Rafinesque.

Body elongated, slender, and much compressed. The caudal peduncle is short but slender, and presents behind the anal an elongated elliptical section.

Head conical in profile, compressed, and with the sides sloping downward and outward. The supraoccipital bone is prolonged backward, and its emarginated apex receives the acuminate anterior point of the second interspinal. The skull is covered by a thin tense skin, through which the sculpture of the bones is apparent. Eyes large and almost entirely lateral. Mouth small, transverse, and terminal. The upper jaw protrudes beyond the lower. Teeth subulate and aggregated into a short, laterally truncated band on each jaw. Branchiostegal rays, 8 or 9. Dorsal fins situated over the interval between the pectoral and ventral fins, higher than long, with one long spine and usually six articulated rays. Adipose fin pedunculated over the posterior portion of the anal. Anal fin long, and provided with from 25 to 35 rays; it commences near the anus. Ventral fins each with one simple and seven branched rays. Pectoral fins each with a stout spine, retrorse-serrate within, and about nine branched rays. The serræ of the pectoral spine vary with age and circumstances, and do not in this genus give good specific characters. Caudal fin elongated and deeply forked, with the lobes equal and pointed.

The genus *Ichthæurus* is at once recognized by the forked caudal fin, its silvery or olivaceous colors, and by its compressed, elongated, and slender body, which give to it a peculiarly graceful appearance, very unlike that of the stout, obese, and large-headed *Amiuri*. The head is smaller in proportion than in *Amiurus*, more compressed, and not covered by so thick a skin; the mouth is proportionally much smaller. But the only invariable generic distinction resides in the mode of inser-

* The characters of the genera of *Siluridae* as here given are arranged from Prof. Gill's Report on Ichthyology of Captain Simpson's Explorations Across the Great Basin of Utah, pp. 416-431, with some additions and modifications.

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tion of the supraoccipital or interparietal bone into the head of the second interspinal. A firm and immovable bridge is thus formed, which gives an uninterrupted passage from the dorsal fin to the snout. The silvery coloration is also a marked distinguishing feature.

It is not generally true that the species of *Ichthælorus* reach a larger size than those of the other genera. *Amiurus nigricans* and *Pelodichthys olivaris* far exceed in size any of the species of *Ichthælorus*.

ANALYSIS OF SPECIES.*

- *. Anal fin extremely elongate, its base about one-third the length of the body (without caudal); its rays 32 to 34 in number; eye small, wholly anterior, the middle of the head being entirely behind its posterior margin; head small, about $4\frac{1}{2}$ in length; depth 4 in adults to $5\frac{1}{2}$ in younger specimens; slope from dorsal to snout somewhat concave, especially in adults; pectoral spine $1\frac{1}{2}$ in head; skin thin; color brightly silvery *FURCATUS*, 1.
- †. Anal fin shorter, $3\frac{1}{2}$ to 4 in length; its rays 24 to 30.
- †. Eye moderate-sized, anterior, the middle of the head being wholly behind it; anal rays 27 to 30; body comparatively stout and deep, compressed behind; the dorsal region elevated; depth $3\frac{1}{2}$ to 4 in length; head pretty large, $4\frac{1}{2}$ to $4\frac{1}{4}$ in length, one-third longer than broad; spines moderate, strong, little more than half-head; profile from dorsal to snout more or less depressed or concave; skin rather thick; colors pale *ROBUSTUS*, 2.
- ††. Eye large, placed mesially, the middle of the length of the head falling within the eye; anal rays 25 to 29; head moderate, about 4 in length; depth about 5; body more elongate and less deep than in *robustus*, the head rather smaller, the eye larger, and the dorsal region less elevated; pectoral and dorsal spines long, each about $1\frac{1}{2}$ in length of head *PUNCTATUS*, 3.

1. ICHTHÆLURUS FURCATUS, (Cuv. & Val.) Gill.

Fork-tailed Channel Cat.

(Figs. 1 and 2.)

Pimelodus furcatus, CUV. & VAL. (1840), iv, 136.—DE KAY (1842), Fishes N. Y. 187.—STORER (1846), Synopsis, 403.

Ichthælorus furcatus, GILL (1862), Proc. Bost. Soc. Nat. Hist. 43.—JORDAN (1876), Man. Vert. 300.—JORDAN & COPELAND (1876), Check List, 159.

Amiurus furcatus, GÜNTHER (1864), Cat. Fishes, v, 103.

Pimelodus affinis, BAIRD & GIRARD (1854), Proc. Acad. Nat. Sci. Phila. 26.—GIRARD (1859), Ich. U. S. and Mex. Bound. 32.

Ichthælorus affinis, GILL (1862), l. c. 43.—JORDAN & COPELAND, l. c. 159.

Amiurus affinis, GÜNTHER (1865), l. c. 103.

Habitat.—Mississippi Valley to Texas.

This species is not nearly so common nor so well known as the *punctatus*. I am unable to distinguish the type specimens of *affinis* from *furcatus*.

* *I. meridionalis* is here omitted, the description not being sufficiently full to allow a satisfactory contrast of its characters with those of *I. robustus*.

2. ICHTHÆLURUS ROBUSTUS, *Jordan, sp. nov.*

Robust Channel Cat.

(Figs. 3 and 4.)

Ictalurus furcatus, NELSON (1876), Bull. Ills. Mus. Nat. Hist. 50.*Habitat*.—Ohio and Mississippi Rivers.

This is a large robust species said to be not uncommon in the Ohio and Mississippi Rivers, and which seems to have been thus far confounded with the related *I. furcatus*. From that species it differs obviously in the shorter anal fin, which has 27 to 30 rays, and forms but one-fourth of the length of the body, without the caudal. It is also a stouter fish, with a larger head and a more elevated dorsal region. From *I. punctatus* this species differs notably by the anterior position of the eyes and by the greater elevation of the dorsal region. Old specimens have the profile somewhat concave as in *I. furcatus*.

The type is a large specimen, about 18 inches long, numbered 20056 in the National Museum. The record of the locality is lost. Another specimen, figured in this paper, was sent me by Prof. S. A. Forbes, from the Ohio River at Cairo. Professor Forbes thinks it common in the Lower Ohio and Mississippi, but that it rarely ascends the Illinois and other tributary rivers.

3. ICHTHÆLURUS PUNCTATUS, (*Raf.*) *Jordan.*

Blue Cat—White Cat—Silver Cat—Channel Cat.

(Figs. 5 and 6.)

Silurus punctatus, RAF. (1818), Amer. Monthly Mag. and Critical Review, Sept. 359.

Ictalurus punctatus, JORDAN (1876), Bull. Buff. Soc. Nat. Hist. 95; (1876), Manual of Vertebrates, 300.—JORDAN & COPELAND (1876), Check List in Bull. Buff. Soc. Nat. Hist. 159.—JORDAN (1877), Annals Lyc. Nat. Hist. N. Y. —, —NELSON (1876), Bull. Ills. Mus. Nat. Hist. 50.

Pimelodus caudafurcatus, LE SUEUR (1819), Mémoires du Muséum, v, 152.*Amiurus caudafurcatus*, GÜNTHER (1864), Catalogue of Fishes, v, 102.

Silurus maculatus, RAF. (1820), Quarterly Journal of Science, Literature, and Arts, London, 48 (et var. *erythroptera*, p. 49).

Pimelodus (Ictalurus) maculatus, RAF. (1820), Ichthyologia Ohniensis, 62.

Silurus pallidus, RAF. (1820), Quart. Journ. Sci. Lit. Arts London, 49 (et var. *marginalis*, *lateralis*, *leucoptera*).

Pimelodus pallidus, RAF. (1820), Ich. Oh. 63.—KIRTLAND (1838), Report Zool. Ohio, 169, 194.

Silurus cerulescens, RAF. (1820), Quart. Journ. Sci. Lit. Arts London, 49 (et var. *melanurus*).

Pimelodus cerulescens, RAF. (1820), Ich. Ohniensis, 63.—KIRTLAND (1838), Rept. Zool. Ohio, 169, 194; (1846), Bost. Journ. Nat. Hist. iv, 332.—STORER (1846), Synopsis Fishes N. A. in Mem. Nat. Acad. Sci. 405. (All these descriptions refer more or less to *Amiurus nigricans*).

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- Ictalurus œaruleoscens*, GILL (1862), Proc. Bost. Soc. Nat. Hist. 43.—COPE (1865), Proc. Acad. Nat. Sci. Phila. 85; (1870), Proc. Am. Philos. Soc. 489.—JORDAN (1874), Ind. Geol. Survey, 222.—GILL (1876), Ich. Capt. Simpson's Exped. 417.
- Ichthallurus œaruleoscens*, COPE (1869), Journ. Acad. Nat. Sci. 237.
- Silurus argentinus*, RAF. (1820), Quart. Journ. Sci. Lit. Arts London, 50.
- Pimelodus argyrus*, RAF. (1820), Ichthyologia Ohienensis, 64.
- Pimelodus furcifer*, CUV. & VAL. (1840), xv, 139.—“HYRTL (1859), Denkschr. Akad. Wiss. Wien, 16.”—“KNER, Sitzgsber. Akad. Wiss. Wien, xxvi, 421.”
- Ictalurus furcifer*, GILL (1862), Proc. Bost. Soc. Nat. Hist. 43.—JORDAN (1876), Manual Vert. 300.
- Pimelodus gracilis*, HOUGH (1853), Fifth Ann. Rept. Reg. Univ. Condition State Cabinet Nat. Hist. Albany, 26.
- Synechoglanis gracilis*, GILL (1859), Trans. Lyc. Nat. Hist. 3 (reprint).
- Ictalurus gracilis*, GILL (1862), Proc. Bost. Soc. Nat. Hist. 43.—COPE (1865), Proc. Acad. Nat. Sci. Phila. 85.—JORDAN (1876), Man. Vert. 300.—JORDAN & COPELAND (1876), Check List, 153.
- Pimelopus vulpes*, GIRARD (1858), Proc. Acad. Nat. Sci. Phila. 170; (1859), U. S. and Mex. Bound. Surv. 33.
- Ictalurus vulpes*, GILL (1862), Proc. Bost. Soc. Nat. Hist. 43.—JORDAN & COPELAND (1876), Check List, 159.
- Pimelodus olivaceus*, GIRARD (1858), Pac. R. R. Survey, x, 211.
- Ictalurus olivaceus*, GILL (1862), l. c. 43; (1876), Rept. Ichthy. Capt. Simpson's Exp. 417.—JORDAN (1876), Man. Vert. 300.—JORDAN & COPELAND (1876), Check List, 159.
- Synechoglanis beadlei*, GILL (1859), Trans. Lyc. Nat. Hist. N. Y. 2 (reprint).
- Ictalurus beadlei*, GILL (1862), Proc. Bost. Soc. Nat. Hist. 43.—JORDAN & COPELAND (1876), Check List, 159.
- Pimelodus houghii*, GIRARD (1859), Proc. Acad. Nat. Sci. Phila. 159.
- Pimelodus megalops*, GIRARD (1859), l. c. 161 (said to have the eye very large, its diameter one-third the length of the side of the head).
- Ictalurus megalops*, JORDAN & COPELAND (1876), Bull. Buff. Soc. Nat. Hist. 159.
- Pimelodus graciosus*, GIRARD (1859), Proc. Acad. Nat. Sci. Phila. 161.
- Pimelodus hammondi*, ABBOTT (1860), Proc. Acad. Nat. Sci. Phila. 568.
- Pimelodus notatus*, ABBOTT (1860), Proc. Acad. Nat. Sci. Phila. 569.
- Ictalurus simpsoni*, GILL (1862), Proc. Bost. Soc. Nat. Hist. 43; (1876), Ich. Capt. Simpson's Exp. 417.

Habitat.—Northern New York; Canada. Great Lake Region, throughout Mississippi Valley, Nebraska, Kansas, to Georgia, Florida, and Texas.

The synonymy of this species is not altogether creditable to workers in American ichthyology. It is one of our most abundant and widely diffused fishes, and one even less subject to variations than species of such wide distribution usually are. And yet, if the above synonymy is correct, we have twenty-three different specific and varietal names applied to it. It would seem as if every naturalist who had obtained a Channel Cat was sure that such a Cat-fish, so slender, so clean, and so white, must surely be unknown to science, or else he would have heard of it before. As a result of this, nearly every writer on American fresh-water fishes has one or more nominal species based on some

stage in the growth of the *Ichthælorus punctatus*, or on some real or imagined variation of it.

The specific name *cærulescens* has been the one most generally employed, although, as will be seen from the above synonymy, eight different specific and varietal names have priority over it. The oldest description is apparently that of Rafinesque under the name of *Silurus punctatus*. The specific name of *punctatus* is accordingly the one to be employed. The other Rafinesquian names evidently apply to different stages in the growth of the species. Rafinesque's *P. cærulescens*, however, as well as that of Dr. Kirtland and others, includes *Amiurus nigricans*. This error has been the source of much confusion; the great Mississippi Cat-fish having been wrongly supposed to be an *Ichthælorus*. I find nothing in the accounts given of *furcifer* and *caudafurcatus* to indicate that they were founded on species distinct from *punctatus*. *I. gracilis* Hough (= *houghii* Grd.) is said to have a less number of anal rays than has been noticed in *punctatus*. Hough's specimens were from Northern New York. I have examined specimens from Saint Lawrence County, New York, presumably referable to *gracilis*, but they have 27 anal rays, and, so far as I can see, are precisely like the ordinary *punctatus*, except that the serrations of the pectoral spine are perhaps a trifle weaker. An examination of the types of *beadlei*, *simpsoni*, *olivaceus*, and *vulpes* shows nothing of specific value. The number of anal rays is 25 to 28 in them all, as in typical *punctatus*. *Olivaceus* appears rather more slender than is usual. *Notatus* and *hammondi* are rather indifferently described, but there is nothing in the description of either to show that it does not belong here. The types of *graciosus* and *megalops* have a rather longer anal fin than usual, and differ slightly in form. I have seen other specimens like them, but am unable to recognize even a variety. Girard's statement of the size of the eye in *megalops* is exaggerated.

4. ICHTHÆLURUS MERIDIONALIS, (Günther) Jordan.

Southern Channel Cat.

(Figs. 7 and 8.)

Amiurus meridionalis, GÜNTHER (1864), Cat. Fishes Brit. Mus. v, 109; (1868), Trans. Zool. Soc. London, 473.

I infer, from the figure only, that this species belongs to *Ichthælorus* rather than to *Amiurus*. Although the distinctive characters of the two genera were made known in 1862, in the description of this species we find no allusion to those characters, and no attempt at comparison

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of the species with those previously known. So far as I can judge from the figure, this species is an affine of *I. robustus*, having, like that species, the eye anterior and the number of anal rays intermediate (28 or 29), but differing in the greater slenderness of the body.

GENUS AMIURUS, (*Rafinesque*) Gill.

Silurus et *Pimelodus* sp., LINNÆUS, and all writers prior to 1862.

Ameiurus, RAFINESQUE (1820), Ich. Ohienensis, 65 (as section under subgenus *Ictalurus* of *Pimelodus*).

Amiurus, GILL (1862), Proc. Bost. Soc. Nat. Hist. 50, and of recent writers generally.

Ameiurus, COPE (1864), Proc. Acad. Nat. Sci. Phila. 231.

Gronias, * COPE (1864), Proc. Acad. Nat. Sci. Phila. 231 (*G. nigrilabris*).

ETYMOLOGY.—*a*, privitive; *meiopus*, curtailed, in allusion to the entire caudal fin.

TYPE.—*Silurus cupreus* Rafinesque.

Body moderately elongated, robust, anteriorly vertically ovate, and scarcely compressed; caudal peduncle also robust, but much compressed, and at its end evenly convex.

Head large, wide, laterally expanded, above ovate and in profile cuneiform; supraoccipital extended little posteriorly and terminating in a more or less acute point, which is entirely separate from the second interspinal buckler; the skin covering the bones is thick.

Eyes rather small, in one species covered by the skin: mouth large, terminal, transverse, the upper jaw in most species the longer; jaws often equal, the lower in one or two species distinctly projecting.

Teeth subulate, aggregated in broad bands on the intermaxillaries and dentaries; the intermaxillary band is convex in front, of equal breadth, and abruptly truncated near the insertion of the intermaxillaries; the lower dental band is anteriorly semicircular, attenuated to the angles of the mouth.

Branchiostegal membrane on each side with eight or nine rays in typical species, ten or eleven in two or three aberrant species; dorsal situated over the interval between the pectorals and ventrals, higher than long, with a pungent spinous ray dentate behind, and about six branched rays; adipose fin short, inserted over the posterior half of the anal; anal fin of moderate length, with from fifteen to twenty-six rays, the usual number being twenty or twenty-one; caudal fin short, usually truncate when spread open, slightly emarginate when not expanded,—in species related to *Icthyolurus* more or less deeply forked, in some other species rounded; when the caudal fin is forked the lobes are usually un-

* Prof. Cope thus defines this genus:—"Head broad, depressed; supraoccipital bone posteriorly free; branchiostegal membrane with ten rays; anterior dorsal spine stout; posterior (adipose) fin separated from caudal; ventrals with eight rays; eyes rudimentary, covered by the corium; natatory bladder present."

equal; ventrals each with one simple and seven branched rays; pectoral fins each with a stout spine, which is commonly retrorse-serrate behind; these narrow vary much with age and circumstances, and do not appear in this genus to furnish good specific characters; lateral line usually incomplete.

This genus includes our common Eastern American Outfishes, and is readily recognized by the broad head covered by a thick skin, the free termination of the posterior process of the supraoccipital bone, the compressed body, and by the free adipose fin.

This genus, though undoubtedly a very natural one, is rather hard to define. Certain species (*lupus*, *niveiventris*, *algricans*) have real affinities with the species of *Ichthaelurus*, having, like them, the body elongate, the head rather narrow, the anal long, the caudal forked, and the coloration pale. The absence of the connection between the supraoccipital and the interspinal is the only technical character by which *Amiurus* may be distinguished from *Ichthaelurus*.

ANALYSIS OF SPECIES.

- *. Caudal fin forked; upper jaw longest; dorsal beginning nearer snout than adipose fin; colors blackish-silvery:
 - t. Anal fin elongate, of 23 to 28 rays:
 - a. Caudal fin deeply furcate; head narrow, longer than broad; anal rays 23 or 24; pectoral spines long and slender, dentate; barbels long; depth about 5 in length; width of head 4½; body rather slender:
 - Head narrowed, its width being less than its length above; distance from snout to dorsal spine 1½ to 1¾ in distance from dorsal spine to adipose fin; base of anal as long as head *LUPUS*, 6.
 - Head broader, its width equal to its length above; distance to dorsal spine 1½ in distance from spine to adipose fin; base of anal notably less than head *NIVEIVENTRIS*, 6.
 - aa. Caudal fin strongly furcate; head 4½ in length, its width 5; anal rays 25 or 26; pectoral spines dentate, short, and stout; barbels long; body rather stout, color dark, often mottled with pale; also very large *ALGRICANS*, 7.
 - aaa. Caudal fin shallow-furcate; pectoral spine not serrate; head broad, as wide as long *HOPEALIS*, 8.
 - tt. Anal fin short and rather low, of 19 to 22 rays; adipose fin very large; humeral process strongly rugose; colors pale, more or less silvery:
 - b. Head narrower, longer than wide, its width 4 to 6 times in length; mouth narrow; upper jaw much projecting; eye large, 3 to 5 in interorbital width; barbels long, except nasal barbel; lateral line almost complete; caudal fin more deeply forked; anal fin 1½ to 5 in length; dorsal about midway between adipose fin and snout *AL*, 8.
 - bb. Head very broad, as wide as long, its width 3½ in length of body; eye 1 to 1½ in interorbital width; caudal not deeply forked; anal fin 5 to 10 in length; mouth wider than in any other species; jaws nearly equal; dorsal much nearer adipose fin than snout; colors pale, somewhat silvery, especially on head *LEONIS*, 10.

.. Caudal fin
t. Body m
c. Anal fin

— H

w. Dorsal fin
z. Jaws
aa. Upper
y. Anal
z. Co
zz. Co
yy. Ana

yyy. Ana

ww. Dorsal fin

aa. Anal fin
d. Lower jaw
e. Body

dd. Jaws equal
f. Eyes
g. Head

BULL. N

- **. Caudal fin not forked, rounded or usually somewhat emarginate, nearly truncate when spread open:
- †. Body moderately elongate, depth one-fifth or more of length; branchiostegals normally 9 or 10:
- a. Anal fin very long, its base one-fourth or more of length of body, of 24 to 26 rays; dorsal spine normally nearer snout than adipose fin:
- Head and body elongated; the dorsal region considerably elevated; the head quite long and narrowed forwards; much longer than broad; its width in front of eye only about half its length; mouth rather narrow, with equal jaws; barbels long; adipose fin large; spines strong; dorsal fin very high; anal fin long and deep; caudal fin short; color dark *EREENNUS*, 11.
- Head wide and flattish, not much longer than broad; rounded in front; the mouth very wide; the dorsal region not much elevated; body more or less stout and thick; branchiostegals 8 or 9, jaws equal or upper jaw longest *NATALIS*, 12.
- w. Dorsal considerably nearer snout than adipose fin:
- x. Jaws equal; spines very short; anal rays 25; colors yellowish-brown, *LIVIDUS*, b.
- xx. Upper jaw distinctly longest:
- y. Anal rays 24 or 25, its rays less than half head, its base $3\frac{1}{2}$ in length of body; the nape not swollen:
- z. Colors pale; yellowish-brown *CUPREUS*, c.
- zz. Colors dark; black or greenish *CANCOSUS*, d.
- yy. Anal rays 26; base of anal $3\frac{1}{2}$ in length, its rays short, less than half length of head; spines weak; head $3\frac{1}{2}$ to 3 in length; distance to dorsal spine 2 to 2 in length; the nape more or less swollen and elevated *ANTONIENSIS*, e.
- yyy. Anal rays 27, its base elongate, $3\frac{1}{2}$ in length, its longest rays more than half head; spines strong; head short, 4 in length, the distance to dorsal nearly 3; nape not swollen *ANATIA*, f.
- ww. Dorsal rather nearer adipose fin than snout; the posterior part of the body being much thicker and proportionally shortened; the caudal fin short; dorsal and ventral outlines nearly parallel; jaws about equal *NATALIS*, g.
- aa. Anal fin moderate, of 19 to 22 rays; branchiostegals normally 8 or 9:
- d. Lower jaw distinctly longest; anal rays 20.
- e. Body moderately elongate, depth $\frac{1}{5}$ to $\frac{1}{6}$ in length; head $3\frac{1}{2}$ to 4; barbel long; mouth wide; head longer than broad, rather narrowed forward; profile rather steep, pretty evenly convex; dorsal region more or less elevated; dorsal spine nearer snout than adipose fin, lower jaw strongly projecting; color blackish (varying in subspecies *alurus* to head blunter and flatter above; dorsal spine rather nearer adipose fin) *VULGARIS*, 13.
- aa. Jaws equal, or upper jaw projecting beyond lower:
- f. Eyes distinct, well developed:
- g. Head moderately broad, a nearly even slope from the tip of the snout to the elevated base of the dorsal:
- Body sharply mottled with brown, greenish, and whitish; the coloration therefore singular among Catfishes; jaws equal or nearly so; depth about 4 in length; slope of profile very steep; dorsal fin high; the spine more than half length of head; dorsal spine nearer adipose fin than snout; barbels long; branchiostegals 10; head $3\frac{1}{2}$ in length *MARMORATUS*, 14.

— Body nearly uniform in color above, or slightly mottled or clouded:

h. Body rather elongate; depth 4 to $4\frac{1}{2}$ in length; head broader than in the next, the front less steep, but the slope from snout to dorsal more uniform; body less rapidly narrowed behind; anal fin longer; its base $4\frac{1}{2}$ in body, the rays usually 21 or 22; dorsal usually rather nearer adipose fin than snout; the upper jaw more elongate; color dark yellowish-brown, varying to dusky or even to black, sometimes more or less clouded CATUS, 15.

hh. Body very short, stout, and deep, the depth $3\frac{1}{2}$ to 4 in length; head moderate, somewhat contracted forward; the front steeply elevated, the body thick across the shoulders, rather rapidly narrowed behind; anal fin short and deep, of 18 to 20 rays, its base nearly 5 in length of body; dorsal nearer adipose fin than snout; jaws nearly equal; size small; color almost black; form varying to extremely short and thick, especially behind, with short caudal fin MELAS, 16.

gg. Head very broad, the slope from snout to base of dorsal quite uneven, there being a more or less decided angle at occiput; head about as broad as long, its length about 4 in body; dorsal spine nearer adipose fin than snout, its rays usually 19 (rarely 18 or 20); body short and stout; mouth very broad; color rather pale, chiefly uniform yellowish-brown, varying to dark brown or pale yellow; head sometimes yellow (*Raf.*); belly yellow; size small XANTHOCEPHALUS, 17.

ff. Eyes more or less rudimentary and concealed beneath the skin; jaws equal; muzzle flat; dorsal spine midway between snout and middle of adipose fin; barbels short; caudal slightly emarginate; anal with 18 rays; color blackish above; jaws and fins black; sides varied with yellowish; belly pale; branchiostegals 10 NIGRILABRIS, 18.

ccc. Anal fin few-rayed (rays 15 to 17):

i. Upper jaw distinctly longest:

j. Body short and stout; depth about 4 in length; head flattened nearly as broad as long; dorsal nearer adipose fin than snout; mouth large; spines moderately serrate; colors very dark, almost black PULLUS, 19.

jj. Body slender, elongate, the depth about $5\frac{1}{2}$ in length; head roundish, rather long, about 4 in length, the width $4\frac{1}{2}$; mouth small; the upper jaw more projecting than in any other of the species known; profile convex, not steep; dorsal fin very high; $\frac{2}{3}$ length of head, well forward, its spine nearer snout than adipose fin; anal fin short and high, its base 5 in length of body; pectoral spine serrated; color pale olive-brown; a blackish horizontal bar at base of dorsal BRUNNEUS, 20.

ii. Body excessively slender, elongate, as in *Pelodichthys*, the depth being 6 to 8 times in length of body; head broad and flat, nearly as wide as long; anal fin with 20 rays; the base of the fin 5 to 5 in body; jaws equal; branchiostegals 11; mouth very wide; dorsal spine nearer snout than adipose fin; coloration ordinary, a blackish horizontal bar at base of dorsal,

PLATYCEPHALUS, 21.

Pimelodus lupinus
Aniurus

Habitat.

This species differs from the shorter generic characters there intervening in the supraocular region nearly connecting species as a museum from

Aniurus nicoleti
(1876),

Habitat.

This species differs in the specimens of

Pimelodus nigricans
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Synopsis
Aniurus nigricans
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THER (1876)

Aniurus (*Pimelodus*)
Pimelodus sp. inc.
Pimelodus coerulescens
nel Cat.

Habitat.—

tributaries, locally.

5. AMIURUS LUPUS, (Girard) Günther.

Texas Cat.

(Figs. 9 and 10.)

Pimelodus lupus, GIRARD (1858), U. S. Pac. R. R. Expl. x, 211.*Amiurus lupus*, GÜNTHER (1864), Cat. Fishes Brit. Mus. v., 101.**Habitat.**—Streams of Texas.

This species strongly resembles *Ichthælurus punctatus*, but differs in the shorter body, wider mouth, and darker colors, as well as in the generic character of the free supraoccipital. In this species, however, there intervenes scarcely more than the diameter of a pin's head between the supraoccipital and the interspinal, in specimens 8 inches long; so nearly connected are they that I was at first disposed to consider this species as an *Ichthælurus*. Numerous specimens of *A. lupus* are in the museum from Texas.

6. AMIURUS NIVEIVENTRIS, Cope.

White-bellied Cat.

(Figs. 11 and 12.)

Amiurus niveiventris, COPE (1870), Proc. Am. Philos. Soc. 486; JORDAN & COPELAND (1876), Check List, 159.**Habitat.**—Neuse River, North Carolina.

This species seems to be very close to *A. lupus*, but appears to differ in the broader head and in some other features. I have seen no specimens of it.

7. AMIURUS NIGRICANS, (Le Sueur) Gill.

Great Fork-tailed Cat—Mississippi Cat.—Florida Cat.

(Figs. 13 and 14.)

Pimelodus nigricans, LE SUEUR (1819), Mémoires du Muséum d'Hist. Nat. v, 153.—CUV. & VAL. (1840), xv, 133.—DE KAY (1842), Fishes N. Y. 180.—STORER (1846), Synopsis, 403.—"HYRTL (1859), Denkschrift Akad. Wiss. Wien, xvi, 16."*Amiurus nigricans*, GILL (1862), Proc. Bost. Soc. Nat. Hist. 44.—JORDAN (1876), Man. Vert. 318.—JORDAN & COPELAND (1876), Check List, 159 (not of GÜNTHER (1864) nor of COPE (1870) = *A. caninus*).*Amiurus* (*Pimelodus*) *nigrescens*, RICHARDSON (1836), Fauna Bor.-Am. Fishes, 134.*Pimelodus* sp. incog., THOMPSON (1842), History Vermont, 139.*Pimelodus oerulescens*, in part of RAFINESQUE, KIRKLAND, and others; the big "Channel Cats" all belong to this species.

Habitat.—Great Lakes and Mississippi River, ascending all the larger tributaries, larger rivers of the South Atlantic and Gulf States generally.

This species is the "Great Fork-tailed Cat" of the Lakes and the "Great Mississippi Cat" of the Mississippi and Ohio Rivers. I have seen and identified specimens of thirty to forty pounds weight, and have seen specimens which I suppose were of this species which weighed nearly a hundred pounds. I have heard of Catfish weighing two or three hundred pounds, but have never seen them, and presume they were "weighed by guess". This species undoubtedly attains the largest size of any of our representatives of the family. Specimens of this species of a large size are in the United States National Museum, from St. John's River, Florida. They appear to have a rather steeper front than the northern ones, but are otherwise similar.

As indicated above, the "*A. nigricans*" of Dr. Günther is probably the *cænosus*, as the present species has the caudal fin strongly forked.

8. AMIURUS BOREALIS, (Richardson) Gill.

The Mathemeg or Land Cod.

Pimelodus borealis, RICHARDSON (1836), Fauna Boreali-Americana, Fishes, 135.—CUV. & VAL. (1840), xv, 130.—STORER (1846), Synopsis, 402.

Amiurus borealis, GILL (1862), Proc. Bost. Soc. Nat. Hist. 44.—GÜNTHER (1864), Cat. Fishes, v, 100.—COPE (1870), Proc. Am. Philos. Soc. 485.—JORDAN & LAND, Check List, 159.

Habitat.—British America.

I do not know this species, and it may not really have a forked caudal fin. It is not improbable that its relations are with *Amiurus cænosus* rather than with *A. nigricans*.

9. AMIURUS ALBIDUS, (Le Sueur) Gill.

Eastern Fork-tailed Cat—"Channel Cat" of the Potomac.

(Figs. 15 and 16.)

Pimelodus albidus, LE SUEUR (1819), Mém. du Mus. d'Histoire Nat. v, 148.—CUV. & VAL. (1840), xv, 131.

Amiurus albidus, GILL (1862), Proc. Bost. Soc. Nat. Hist. 44.

Pimelodus nebulosus, CUV. & VAL. (1840), xv, 132 (in part; not of Le Sueur).

Amiurus nebulosus, GÜNTHER (1864), Cat. Fishes, v, 101.

Pimelodus lynx, GIRARD (1859), Proc. Acad. Nat. Sci. Phila. 160.

Amiurus lynx, GILL (1862), Proc. Bost. Soc. Nat. Hist. 44.—COPE (1870), Proc. Am. Philos. Soc. 485.—UHLER & LUGGER (1876), Fishes Maryland, 152.—JORDAN (1876), Man. Vert. 500.—JORDAN & COPELAND (1876), Check List, 160.

Ictalurus macaskeyi, STAUFFER (1869), Mombert's History Lancaster Co. Pa. 578.

Ictalurus keviniskii, STAUFFER (1869), Mombert's History Lancaster Co. Pa. 578.

Habitat.—Atlantic streams, Pennsylvania to North Carolina.

The *Pimelodus albidus* of Le Sueur * seems to me rather to have been

* Le Sueur says: "Tête large, aplatie; * * * couleur d'un blanc cendré * * * caudale très légèrement échancrée," characters evidently belonging to the *lynx* rather than to the *catas*. This is the more plain, as in describing the distinctly fork-tailed

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based on this species than on an albino of *catus*, as supposed by Prof. Cope. I have therefore substituted the appropriate name *albidus* for the unmeaning *lynx*. This is an extremely variable species. Old specimens bear a strong resemblance to the next species, while the young are quite slender.

10. AMIURUS LOPHIUS, Cope.

Big-mouthed Cat.

(Figs. 17 and 18.)

Amiurus lophius, COPE (1870), Proc. Am. Philos. Soc. 486.—JORDAN (1876), Manual Vert. 301.—JORDAN & COPELAND (1876), Check List, 160.

Habitat.—Streams tributary to Chesapeake Bay. *A. lophius* is a common fish in the Washington markets.

The synonymy of this species requires no special remark.

11. AMIURUS EREBENNUS, (Jordan) sp. nov.

Goode's Cat.

(Figs. 19 and 20.)

Habitat.—St. John's River, Florida.

This species is related to *A. nigricans* and others of the fork-tailed group, but has the truncate caudal fin of *A. lividus*.

Body rather elongate, compressed, the depth about $4\frac{1}{2}$ in length; dorsal region rather elevated, the head quite long and narrowed forward, 4 times in length of body. The head is more narrowed than in any of the other species except *A. lupus*. The width of the head in front of the eye is but little more than half its length. The width of the mouth is about half the length of the head. The greatest width of the head is contained about $1\frac{1}{2}$ times in its length. The dorsal fin is slightly nearer the snout than the adipose fin.

The dorsal fin is unusually high, its spine is long, as in the species of *Heltheturus*. The pectoral spine is very strong and it is about half as long as the head. The anal fin is long and deep. It is nearly one-fourth the length of the body, and is composed of 24 rays. The adipose fin is large. The caudal fin is rather short and is truncate behind.

The jaws are equal. The supraoccipital bone is but little free behind. The branchial apertures are rather more restricted than usual.

Le Sueur says, "caudale légèrement échancrée en croissant." It seems that Gill had some time since independently reached a similar conclusion, and that the "*Amiurus lynx*" has been for some time correctly known as *A. albidus* by the members of the Fish Commission.

Color very dark. The type-specimen is quite black, both body and fins; the belly is pale, but the lower barbels as well as the upper ones are black.

The type was collected in the St. John's River, Florida, by Mr. G. Brown Goode. It is a little more than a foot long.

This species is intermediate between *A. lupus* and *A. lividus*, having the narrowed head, high dorsal, and small mouth of the first, with the short, truncate caudal fin of the second.

12. AMIURUS NATALIS, (*Le Sueur*) Gill.

Catfish—Yellow Cat.

a. Subspecies NATALIS.

(Figs. 21 and 22.)

Pimelodus natalis, LE SUEUR (1819), Mém. du Muséum, v, 154—STORER (1846), Synopsis, 405.

Amiurus natalis, GILL (1862), Proc. Bost. Soc. Nat. Hist. 44—GÜNTHER (1864), Cat. Fishes Brit. Mus. v, 101.

Pimelodus puma, GIRARD (1859), Proc. Acad. Nat. Sci. Phila. 160.

Habitat.—Great Lakes to North Carolina and south.

b. Subspecies LIVIDUS, Raf.

(Figs. 23 and 24.)

Silurus lividus, RAFINESQUE (1820), Quart. Journ. Sci. Lit. Arts, London, 48 (et var. *fuscatus*).

Pimelodus lividus, RAFINESQUE (1820), Ich. Ohiensis, 65.

Amiurus lividus, JORDAN (1876), Man. Vert. 302.—JORDAN & COPELAND (1876), Check List, 159.

Pimelodus felinus, GIRARD (1858), U. S. Pac. R. R. Expl. x, 209.

Amiurus felinus, GILL (1862), Proc. Bost. Soc. Nat. Hist. 44.—COPE (1870), Proc. Am. Philos. Soc. 485.—JORDAN & COPELAND (1876), Check List, 159.

Pimelodus catus, GRD. (1859), Proc. Phila. Acad. Nat. Sci. 160 (not of De Kay and most authors).

Amiurus catus, COPE (1870), Proc. Am. Philos. Soc. 484.—JORDAN & COPELAND, Check List, 159.

Pimelodus cupreoides, GIRARD (1859), Proc. Acad. Nat. Sci. Phila. 159.

Amiurus cupreoides, GILL (1862), Proc. Bost. Soc. Nat. Hist. 44.

Habitat.—Ohio Valley to Arkansas. North Carolina and south.

c. Subspecies CÆNOSUS, (*Richardson*) Gill.

(Figs. 25 and 26.)

Silurus (Pimelodus) cænopus, RICHARDSON (1836), Fauna Bor.-Amer. Fishes, 132.—CUTLER & VAL (1840), xv, 129.—DE KAY (1842), Fishes N. Y. 186.—STORER (1846), Synopsis, 402.

Amiurus cænopus, GILL (1862), Proc. Bost. Soc. Nat. Hist. 44.—COPE (1870), l. c. 485.—JORDAN (1876), Man. Vert. 303.—JORDAN & COPELAND, Check List, 159.

Habitat.—Maine to Great Lakes and northward.

Silurus cupreoides

Pimelodus cupreoides

Pimelodus cupreoides

Jordan

Synonymy

Amiurus cupreoides

Amiurus cupreoides

Amiurus cupreoides

Amiurus cupreoides

Amiurus cupreoides

Amiurus cupreoides

Amiurus cupreoides

Habitat.—

Pimelodus antoniensis

Amiurus antoniensis

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Habitat.—

I have hitherto

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A. antoniensis

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Specimens from

d. Subspecies CUPREUS, (Raf.) Gill.

(Figs. 27 and 28.)

Silurus cupreus, RAF. (1820), Quart. Journ. Sci. Lit. Arts, London, 51.*Pimelodus (Ameiurus) cupreus*, RAFINESQUE (1820), Ioh. Oh. 65.*Pimelodus cupreus*, KIRTLAND (1838), Rept. Zool. Ohio, 169, 194; (1846), Bost. Journ. Nat. Hist. iv, 333.—DE KAY (1842), Fishes N. Y. 187.—STORER (1846), Synopsis, 404.—GIRARD (1859), Proc. Acad. Nat. Sci. Phila. 159.*Amiurus cupreus*, GILL (1862), Proc. Bost. Soc. Nat. Hist. 44.—COPE (1870), Proc. Am. Phil. Soc. 485.—JORDAN (1876), Bull. Buff. Soc. Nat. Hist. 96; (1876), Man. Vert. 303.—NELSON (1876), Bull. Ills. Mus. Nat. Hist. 50.—JORDAN & COPELAND (1876), Check List, 159.—NELSON (1876), Bull. Ills. Mus. Nat. Hist. 50.—JORDAN (1877), Annals Lyceum Nat. Hist. N. Y. —.—JORDAN (1877), Proc. Acad. Nat. Sci. Phila. 45.*Ameiurus cupreus*, COPE (1865), Proc. Acad. Nat. Sci. Phila. 276.*Habitat*.—Ohio Valley, Mississippi Valley, and south.*e. Subspecies ANTONIENSIS, (Grd.) Gill.*

(Figs. 29 and 30.)

Pimelodus antoniensis, GIRARD (1859), Pac. R. R. Expl. x, 291.*Amiurus antoniensis*, GILL (1862), L. c. 44.—COPE (1870), l. c. 485.*Habitat*.—Georgia to Texas.*f. Subspecies ANALIS, Jordan.*

(Figs. 31 and 32.)

Habitat.—Arkansas River.

I have hitherto followed Girard in identifying this species with *Silurus catus* of Linnæus, but a glance at the original description is sufficient to show the error of such an identification. The first name in order of time which seems to have been given to this species is that of *Pimelodus natalis* Le Sueur, but the best of the early descriptions is that of Rafinesque as *Pimelodus lividus*.

The original description of *cupreus* is incorrect in ascribing 15 anal rays instead of 25. This is probably a misprint. The form or subspecies here indicated as *cupreus* is the one most widely diffused. The type of Girard's *catus* differs only from specimens labelled (by him?) *cupreus* in having the jaws equal. The form called *cænosus* seems to differ chiefly in coloration; this species, like most others, being of a much darker color in the Northern Lakes.

A. antoniensis Grd. is also slightly different in form. The specimens obtained by me in the Etowah River, Georgia, I refer to *antoniensis*. They are short in body, with a swollen nape and a rather longer anal fin. Specimens from Little Red River, Arkansas, collected by Prof. H. S.

Reynolds, with an extremely long anal fin and some peculiarities of form, I have termed var. *analis*.

The description of *Pimelodus natalis* Le Sueur appears to have been based on an individual with the caudal peduncle swollen and elevated.

It appears that most of the species have what may be termed "*natalis*" forms, i. e., individuals with the post dorsal region shortened and thickened, with the adipose fin enlarged, and with the caudal fin very short; owing to the encroachment of the flesh on its rays. These forms often appear more distinct from the normal type than do any two allied species. The names *puma* and *natalis* seem to have been based on the *natalis* type of this species. *Catulus* and *confinis* are the *natalis* form of *melas*, and so on. Whether these peculiar forms are distinct races or aberrant individuals, or stages in the life of an individual, or what they are, I have not now sufficient evidence to enable me to decide. I can only say that I do not at present consider them distinct species.

13. AMIURUS VULGARIS, (Thompson) Nelson.

Long-jawed Catfish.

a. Subspecies VULGARIS.

(Figs. 33 and 34.)

Pimelodus vulgaris, THOMPSON (1842), History of Vermont 132.

Amiurus vulgaris, NELSON (1876), Bull. Ills. Mus. Nat. Hist. 50.—JORDAN & COPELAND (1876), Check List, 159.

Pimelodus dekayi, GIRARD (1859), Proc. Acad. Nat. Sci. Phila. 160.

Amiurus dekayi, GILL (1862), Proc. Bost. Soc. Nat. Hist. 44.—COPE (1870), Proc. Am. Philos. Soc. 485.—JORDAN (1876), Man. Vert. 302.

Habitat.—Lake Champlain and Great Lake region.

b. Subspecies ÆLURUS, (Girard) Gill.

(Fig. 35.)

Pimelodus ælurus, GIRARD (1859), U. S. Pac. R. R. Surv. Fishes, 210.

Amiurus ælurus, GILL (1862), Proc. Bost. Soc. Nat. Hist. 44.

Amiurus ælurus, COPE (1870), Proc. Am. Philos. Soc. 485.—JORDAN (1876), Man. Vert. 302.—JORDAN & COPELAND (1877), Check List, 159.

Habitat.—Upper Mississippi River, Missouri River and their tributaries, also in Red River of the North.

Girard's statement that his *dekayi* is the same as De Kay's *Pimelodus catus* is certainly incorrect, if any reliance is to be placed on descriptions. That Thompson's *vulgaris* is the same as *dekayi* I have no doubt. *Amiurus ælurus*, of which I have examined the types as well as numer-

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ous specimens from the Red River of the North, from the Mississippi River at Saint Louis, and from the Illinois River, differs somewhat in proportions; but I think it specifically identical with *A. vulgaris* from Lake Erie.

14. AMIURUS MARMORATUS, (*Holbrook*) Jordan.

Marbled Catfish.

(Figs. 36 and 37.)

Pimelodus marmoratus, HOLBROOK (1855), Journ. Acad. Nat. Sci. Phila. 54.

Habitat.—Georgia to Florida.

This beautiful and singular species seems to have been overlooked by all writers since the original description. The characters given in the preceding analysis are taken from a specimen sent by Dr. Holbrook to the United States National Museum. It differs from *catus* chiefly in the coloration. I have been informed that similarly colored Catfishes occur in Pennsylvania, and I have seen a crayon sketch of one such by Mr. J. H. Richard.

15. AMIURUS MELAS, (*Rafinesque*) Jordan & Copeland.

Small Black Catfish.

(Figs 38 and 39.)

Silurus melas, RAFINESQUE (1820), Quart. Journ. Sci. Lit. Arts, London, 51.

Pimelodus melas, RAFINESQUE (1820), Ichthyologia Obfensis, 66.

Amiurus melas, JORDAN & COPELAND (1876), Check List, 159.

Pimelodus catulus, GIRARD (1858), U. S. Pac. R. R. Surv. 208.

Amiurus catulus, GILL (1862), Proc. Bost. Soc. Nat. Hist. 44.—COPE (1870), Proc.

Am. Philos. Soc. 485.—JORDAN & COPELAND (1876), Check List, 159.

Pimelodus confinis, GIRARD (1859), Proc. Acad. Nat. Sci. Phila. 159.

Amiurus confinis, GILL (1862), Proc. Bost. Soc. Nat. Hist. 44.—COPE (1870), Proc.

Am. Philos. Soc. 486.—JORDAN (1876), Man. Vert. 301.—NELSON (1876), Bull.

Ills. Mus. Nat. Hist. 50.—JORDAN & COPELAND (1876), Check List, 159.

Amiurus obesus, GILL (1862), Proc. Bost. Soc. Nat. Hist. 45.—JORDAN & COPELAND (1876), Check List, 159.—GILL (1876), Ich. Capt. Simpson's Explorations, 420.

Amiurus nebulosus, COPE & YARROW (1876), Zool. Lieut. Wheeler's Surv. West of 100th Meridian, v, 640 (excl. syn.).

Amiurus pullus, NELSON (1876), Bull. Ills. Mus. Nat. Hist. 50 (not *P. pullus* De K.).

This species occurs abundantly throughout the Mississippi Valley, replacing the allied species *catus*. Prof. Cope considers it a variety of *catus*; but the short deep body and small anal fin thus far have served to distinguish it. The coloration of the anal fin is somewhat characteristic. The membrane is unusually black and contrasts with the pale rays.

Girard's types of *confinis* and *catulus* appear to be the shortened or



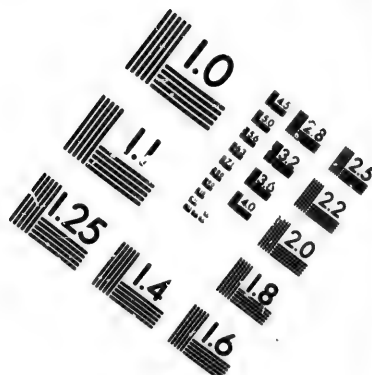
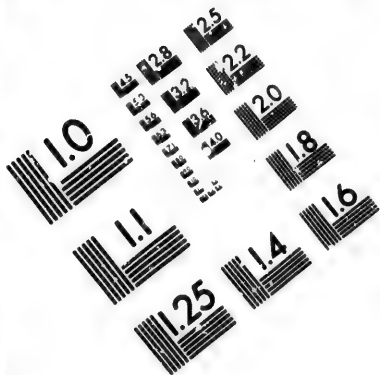
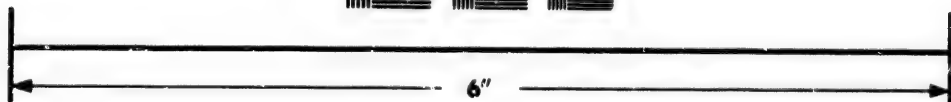
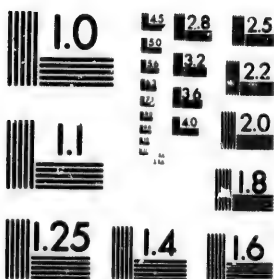


IMAGE EVALUATION TEST TARGET (MT-3)



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(716) 872-4903

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natalis form of this species. There is certainly nothing in the emargination of the caudal fin in which *confinis* and *hoyi* differ from the rest of the species with the caudal fin truncate, as has been supposed by Prof. Cope, on the strength of Girard's description.

The only good description of this species is that of Prof. Gill, under the name of *Amiurus obesus*, in the report of Captain Simpson's Explorations. I have no doubt of the identity of Rafinesque's *melas* with the *obesus*. The *obesus* occurs in considerable abundance about the Falls of the Ohio, and Rafinesque's description is reasonably accurate.

16. AMIURUS CATUS, (L.) Gill.

Bullhead—Hornpout—Catfish.

(Figs. 40 and 41.)

- Bagre secundæ species* *Maregr. affinis*, CATESBY (1750), Fishes etc. Carolina, 23, tab. xxiii (a most wretched figure, absolutely unidentifiable).
Silurus catus, LINN. (1758), Syst. Nat. x, p. 305; (1766), xii, p. 504.—BLOCH. SCHN. (1801), 387.—MITCHILL (1818), Journal Lit. & Philos. Soc. N. Y. i, 433.
Pimelodus catus, CUV. & VAL. (1840), xv, 124.—DE KAY (1842), Fishes N. Y. 182.—STORER (1846), Synopsis, 402.
Amiurus catus, GILL (1862), Proc. Bost. Soc. Nat. Hist. 44.—GÜNTHER (1864), Cat. Fishes, v, 99 (excl. syn. pars).—UHLER & LUGGER (1876), Fishes of Maryland, 152.
Pimelodus nebulosus, LE SUEUR (1819), Mém. de Muséum, v, 149.—STORER (1838), Rept. Fishes Mass. 102.
Amiurus nebulosus, GILL (1862), Proc. Bost. Soc. Nat. Hist. 44.—COPE (1870), Proc. Am. Philos. Soc. 435.
Pimelodus atrarius, DE KAY (1842), Fishes N. Y. 185.—STORER (1846), Synopsis, 404; (1855), Fishes of Mass. 279.
Amiurus atrarius, GILL (1862), Proc. Bost. Soc. Nat. Hist. 44.—JORDAN (1876), Man. Vert. 30.—NELSON (1876), Bull. Ills. Mus. Nat. Hist. 50.—JORDAN & COPELAND (1876), Check List, 159.—JORDAN (1877), Proc. Acad. Nat. Sci. Phila. 46.
Pimelodus felis, AGASSIZ (1850), Lake Superior, 281.
Amiurus felis, GILL (1862), Proc. Bost. Soc. Nat. Hist. 44.
Pimelodus hoyi, GIRARD (1859), Proc. Acad. Nat. Sci. Phila. 159.
Amiurus hoyi, GILL (1862), Proc. Bost. Soc. Nat. Hist. 44.—COPE (1870), Proc. Am. Philos. Soc. 486.—JORDAN (1876), Man. Vert. 301.—JORDAN & COPELAND (1876), Check List, 159.
Pimelodus vulpeculus, GIRARD (1859), Proc. Acad. Nat. Sci. Phila. 160.
Amiurus vulpeculus, GILL (1862), Proc. Bost. Soc. Nat. Hist. 44.

Variety? MISPELLIENSIS.

- Amiurus missilliensis*, COPE (1870), Proc. Am. Philos. Soc. 486.—JORDAN & COPELAND (1876), Check List, 159.

Habitat.—Great Lake Region and Upper Mississippi to Arkansas and northward; also in streams of the Atlantic States from Maine south to Carolina.

I have restored the name of *catus** to this species, following in this respect Valenciennes and the older American authors rather than Girard, who transferred the name to an entirely different species. The fact that Linnæus counted twenty anal rays renders it unlikely that he had a specimen of *lividus*, a species with twenty-five anal rays before him. As it is not possible to say with certainty what species he did have, we must adopt Valenciennes's identification of it until it is shown that it is probably erroneous. The following is Linnæus's description (*Systema Naturæ*, xii, 504):—

Catus 12. S. pinna dorsali postica adiposa, ani radiis 20. Cirris 8. B. 5, D $\frac{1}{2}$, O. P $\frac{1}{2}$ V. 8, A. 20. C. 17.

Catesb. car. 2. p. 23. t. 23. Bagre 2. *Maregr. affinis.*

Maregr. bras. 173. Bagre species, 2.

Habitat in America, Asia.

Ex—Asia vidl pinnis ventr. radiis 6.

The species termed *atrarius*, *nebulosus*, and *catus* by the earlier authors are evidently identical.

There is nothing in the long description of *Pimelodus felis* to indicate that it is distinct from the common Lake Bullhead. In the elaborate enumeration of characters, individual and generic, given by Prof. Agassiz, nearly all that is specific seems to be lost.

On examination of the type-specimens of *Pimelodus hoyi* Grd., and *P. vulpeculus*, Girard, I am unable to see that they differ at all from this species. The caudal fin is not more emarginate than is usual in *catus*.

Amiurus mississippiensis Cope appears to differ in some respects; but these are probably individual peculiarities, as but one specimen seems to be known.

The best figure of this species is that given by Dr. Storer under the name of *Pimelodus atrarius*.

* In the twelfth edition of the *Systema Naturæ* (p. 503), Linnæus describes a *Silurus felis*, which has been considered a species of *Amiurus*. An examination of Linnæus's description has satisfied Prof. Gill and myself that *S. felis* was most probably based on *Arius milberti* C. & V. This latter species should then stand as *Ariopsis felis* (L.) Gill & Jordan.

The following is the original description:

Felis. 10. S. pinna dorsali postica adiposa, ani radiis 23 cirris 6, cauda bifida. B. 5, D $\frac{1}{2}$, O. P. $\frac{1}{2}$ V. 6, A. 23, C. 31.

Habitat in Carolina. D. Garden.

Cirri sub labio inferiori 4, supra sinus oris utrinque 1. Dorsum caruleseens. P. ventrales analoque rubescentes. Cauda bifida. *Affinis S. Cato.*

17. AMIURUS XANTHOCEPHALUS, (*Rafinesque*) Gill.

Small Yellow Catfish.

(Figs. 42 and 43.)

Silurus xanthocephalus, RAF. (1820), Quart. Journ. Sci. Lit. Arts, London, 51.*Pimelodus xanthocephalus*, RAF. (1820), Ich. Ohiensis, 66.—KIRTLAND (1838), Rept. Zool. Ohio, 169, 194.—STORER (1846), Synopsis, 405.*Amiurus xanthocephalus*, GILL (1862), Proc. Bost. Soc. Nat. Hist. 44.—JORDAN & COPELAND (1876), Check List, 159.—JORDAN (1877), Ann. Lyc. Nat. Hist. N. Y. —.*Pimelodus catus*, KIRTLAND Bost. Journ. Nat. Hist. v. 330. (excl. syn.).*Amiurus albidus*, JORDAN (1876), Man. Vert. 302 (not *Pimelodus albidus* Le Sueur).—NELSON (1876), Bull. Ills. Mus. Nat. Hist. 50.*Amiurus nebulosus*, JORDAN (1877), Proc. Acad. Nat. Sci. Phila. 45.*Habitat*.—Ohio Valley.

Rafinesque's description of this species is rather indifferent. Later writers seem to have overlooked the species altogether, or to have confounded it with *A. catus*. It is certainly quite distinct from *A. catus*, and apparently from all the others here mentioned. The peculiar profile, wide head, as well as the short and small anal fin, are characteristic. These points are fairly shown in Dr. Kirtland's otherwise bad figure of his *Pimelodus catus*.

18. AMIURUS NIGRILABRIS, (*Cope*) Gill & Jordan.

Blind Catfish.

(Figs. 44 and 45.)

Gronias nigrilabris, COPE (1864), Proc. Acad. Nat. Sci. Phila. 231.—JORDAN (1876), Man. Vert. 304.—JORDAN & COPELAND (1876), Check List, 160.*Amiurus nigrilabris*, GILL, MSS.

Habitat.—Cave streams tributary to the Conestoga River in Eastern Pennsylvania.

The concealed condition of the eyes in this species is not considered by Prof. Gill as a character of sufficient importance to warrant its generic separation.

A. nigrilabris is apparently descended from *A. pullus* or some similar species, its eyes being modified by its subterranean life.

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19. AMIURUS PULLUS, (*De Kay*) *Gill*.

Black Bullhead of New York.

(Figs. 46 and 47.)

Pimelodus pullus, DE KAY (1842), Fishes N. Y. 184.—STOREY, Synopsis (1846), 404.*Amiurus pullus*, GILL (1862), Proc. Bost. Soc. Nat. Hist. 44.—COPE (1870), Proc.

Am. Philos. Soc. 485.—JORDAN (1876), Man. Vert. 301.—JORDAN & COPELAND (1876), Check List, 159.

Habitat.—Western New York to Northern New England.

This species resembles *A. catus*, but is distinguishable by the short anal fin. From *A. melas* the broader head and some other peculiarities separate it. It is possible, however, that it is a variety of the latter species.

20. AMIURUS BRUNNEUS, *Jordan*.

Small Brown Cat.

(Fig. 48 and 49.)

Amiurus brunneus, JORDAN (1876), Annals Lyc. Nat. Hist. N. Y. —.*Habitat*.—Ocmulgee River, Georgia.

This species is one of the most strongly marked of the genus. It bears some resemblance to the species of *Noturus*.

21. AMIURUS PLATYCEPHALUS, (*Girard*) *Gill*.

Flat-headed Cat.

(Figs. 50 and 51.)

Pimelodus platycephalus, GIRARD (1859), Proc. Acad. Nat. Sci. Phila. 161.*Amiurus platycephalus*, GILL (1862), Proc. Bost. Soc. Nat. Hist. 44.—COPE (1870), Proc. Am. Phil. Soc. 495.—JORDAN & COPELAND (1876), Check List, 159.*Habitat*.—North Carolina to Georgia.

This species has the form of *Pelodichthys*, as well as the increased number of branchiostegals. The dorsal spine is, however, well developed, and the anal fin has the usual number of rays, although only 17 were counted by Prof. Cope. The lower jaw does not project, and the dentition is of the pattern usual in *Amiurus*.

GENUS PELODICHTHYS, (*Rafinesque*) *Gill & Jordan*.*Glanis*, RAFINESQUE (1818), Am. Monthly Mag. & Crit. Review, 447 (named but not characterized).*Pelodictis*, RAFINESQUE (1819), Prodrome de Soixante-dix Nouv. Genres &c. in Journal de Physique de Chimie et d'Histoire Naturelle Paris, 422.

Leptops, RAFINESQUE (1820), *Ichthyologia Ohnensis*, 64.

Opladclns, RAFINESQUE (1820), *Ichthyologia Ohnensis*, 64.

Iliclis, RAFINESQUE (1820), *Ichthyologia Ohnensis*, 66.

Pylodictis, RAFINESQUE (1820), *Ichthyologia Ohnensis*, 67.

Hopladelus, GILL (1862), *Proc. Bost. Soc. Nat. Hist.* 45, and of most late authors.

Pelodichthys, GILL & JORDAN, MSS.—JORDAN (1876), *Ann. Lyc. Nat. Hist. N. Y.* —.

Pimelodus sp., KIRTLAND, CUV. & VAL. et Auct.

ETYMOLOGY.—*πηλος*, mud; *ιχθυς*, fish.

TYPE.—*Pilodictis limosus* Raf. = *Silurus olivaris* Raf.

Body much elongated, very slender, much depressed, anteriorly broader than high. Head large, very wide and depressed, latterly expanded, above broadly ovate, and in profile cuneiform. Skin very thick, entirely concealing the skull. Supraoccipital bone entirely free from the head of the second interspinal. Eyes small. Mouth very large, anterior and transverse. The lower jaw always projects beyond the upper. Teeth in broad villiform bands on the intermaxillaries and dentaries. The intermaxillary band is convex anteriorly, and proceeds to the insertion of the maxillaries, where it is abruptly angularly deflected, and proceeds backward as an elongated triangular extension. The band at the symphysis is slightly divided and anteriorly separated by a small triangular extension of the labial membrane. The lower dental is anteriorly semicircular and attenuated to the corners of the mouth. There are about twelve branchiostegal rays on each side.

The dorsal fin is situated over the posterior half of the interval between the pectorals and ventrals, and has a spine and about seven branched rays. The spine is rather small, and more or less enveloped in the thick skin.

The adipose fin is large, and has an elongated base resting over the posterior half of the anal; it is very obese and inclines rapidly backward; it is rather less free posteriorly than in *Amiurus*.

The anal fin is small; it commences far behind the anus, is a little longer than high, and is composed of about thirteen rays.

The caudal fin is oblong, subtruncated, placed on a vertical basis, and with numerous accessory simple rays, recurrent above and beneath the caudal peduncle.

The pectorals have a broad, compressed spine, serrated or dentated on its external and internal margins, and with the prolonged fleshy integument obliquely striated.

The ventrals are rounded and have nine rays, one simple and eight branched.

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Habitat

The anus is situated behind the ventrals, some distance behind their bases, and much in advance of the anal fin.

Coloration: brown or yellowish, more or less marbled or spotted.

The genus *Pelodichthys* is at first sight recognized by the long body, flat in front; the depressed and broad oblong head with the projecting lower jaw, by the posterior extension of the upper bands of teeth, by the partly concealed dorsal spine, the small size of the anal fin, and the recurrence of the caudal fin. But one species is definitely known. The various nominal species described by Rafinesque and Valenciennes, I think, were all based on the common *olivaris*.

Those who hold that the mere naming of a genus, without explanation or attempt at characterization, gives validity to such name, will call this genus *Glanis* instead of *Pelodichthys*.

ANALYSIS OF SPECIES.

*Body very long, slender, depressed forwards, closely compressed behind, the head extremely flat, the lower jaw longest; barbel short; dorsal spine small, half the height of the fin, enveloped in thick skin; pectoral spine very strong, flattened, serrate behind; caudal somewhat emarginate; anal short, its base about 7 in body, of 12 to 15 rays; premaxillary band of teeth with a large distinct backward process on each side; coloration mottled brown and yellowish, whitish below; size large,

OLIVARIS, 22.

22. PELODICETHYS OLIVARIS, (*Rafinesque*) Gill & Jordan.

Mud Catfish.

(Figs. 52 and 53.)

Silurus olivaris, RAFINESQUE (1818), Am. Monthly Mag. iii, Sept. 355.

Hopladetus olivaris, GILL (1862), Proc. Bost. Soc. Nat. Hist. 45.—COPE (1869), Journ. Acad. Nat. Sci. Phila. 237.—JORDAN (1876), Man. Vert. 303.—NELSON (1876), Bull. Ills. Mus. Nat. Hist. 50.—GILL (1876), Ich. Capt. Simpson's Expl. 426.—JORDAN & COPELAND (1876), Check List, 160.—JORDAN (1877), Proc. Acad. Nat. Sci. Phila. 46.

Pelodichthys olivaris, JORDAN (1877), Ann. Lye. Nat. Hist. N. Y. —.

Glanis limosus, RAF. (1818), Am. Monthly Mag. iii, 447, and iv, 107 (name only).

Pilodictis limosus, RAF. (1819), Journal de Physique, 422.

Pylodictis limosus, RAF. (1820), Ich. Ohiensis, 67.

Silurus nebulosus, RAF. (1820), Quart. Journ. Sci. Lit. Arts, London, 50.

Pimelodus nebulosus, RAF. (1820), Ich. Oh. 64.

Silurus viscosus, RAF. (1820), Quart. Journ. Sci. Lit. Arts, 50.

Pimelodus viscosus, RAF. (1820), Ich. Oh. 66.

Silurus limosus, RAF. (1820), Quart. Journ. Sci. Lit. Arts, 51.

Pimelodus limosus, RAF. (1820), Ich. Oh. 67.—KIRTLAND (1846), Bost. Journ. Nat. Hist. iv, 335.—STORER (1846), Synopsis, 404.

Pimelodus punctulatus, CUV. & VAL. (1840), xv, 134.—DE KAY (1842), Fishes N. Y. 187.—STORER (1846), Synopsis, 403.—GÜNTHER (1864), Cat. Fishes, v, —.

Pimelodus aeneus, CUV. & VAL. (1840), xv, 135.—DE KAY (1842), l. c.—STORER (1846), l. c. 403.

Habitat.—Ohio Valley to Iowa and South.

GENUS NOTURUS, *Rafinesque*.

Noturus, RAF. (1818), Am. Monthly Mag. and Crit. Rev. iv, Nov. 41, and of most subsequent authors.

Schilbeodes, BLEEKER (1858), "Ichthyologia Archipelagi Indici Prodromus, vol. i. Siluri (Acta Societatum Indo-Nederlandica, vol. iv.) 258, (*S. gyrimus* Mit.)." (Also written *Schilbeoides*; I do not know which is the original orthography.)

ETYMOLOGY.—*νυτος*, back; *ουρα*, tail ("means tail over the back", Raf.).

TYPE.—*Noturus flavus* Raf.

Body more or less elongate, anteriorly subcylindrical, thence more or less compressed.

Head above ovate and depressed, with a slight longitudinal furrow, branching into a transverse depression on the nape. Skin very thick, entirely concealing the bones. Supraoccipital entirely free from the head of the second interspinal. Eyes small or of moderate size. Mouth anterior, rather large, and transverse. Upper jaw usually more or less projecting beyond the lower. Teeth subulate, closely aggregated in a broad band in each jaw, which in the lower one is interrupted by a linear interval and in the upper one is continuous. The band in the upper jaw is either abruptly truncated at each end (subgenus *Schilbeodes*) or prolonged backward by a continuation from the postero-external angle (subgenus *Noturus*). The lower band is, as usual, attenuated toward the corners of the mouth. Branchiostegal membrane with nine rays on each side.

Dorsal fin situated over the posterior half of the interval between the pectoral and ventral fins, with a very pungent, short, edentulous spine and seven branched rays.

Adipose fin long and low, connected with the accessory rays of the caudal fin, and not forming a separate fin, never free behind; the membrane sometimes high and continuous, sometimes notched, in one species to the base.

Caudal fin very obliquely truncated or rounded, and inserted on an equally obliquely rounded base. The rays rapidly decrease in length inferiorly, and there are numerous rudimentary ones both above the caudal peduncle, where the anterior is united to the adipose fin, and forms a continuous keel (interrupted in one species), and below, where they advance considerably forward.

The anal fin is comparatively short, and rapidly increases in height for the first half of its length. It has from 12 to 20 rays.

The ventrals are rounded, and each has one simple and eight branched rays.

Pectoral fins with a sharp spine, either smooth, grooved, or dentate behind, the size and armature of the spine affording good specific characters.

The anus is situated some distance in advance of the anal fin.

The lateral line is complete.

The *Noturi* may be known at once by the peculiarities of the adipose and caudal fins. The genus is rather less homogeneous than any of the others.

Two subgeneric sections are recognizable:—

Noturus.—Size large; intermaxillary band of teeth with a backward process; pectoral spine nearly smooth within, sharply retrorse-serrate externally; a keel between dorsal and adipose fins.

Schilbeodes.—Size moderate or small; intermaxillary band of teeth without backward process; pectoral spine more nearly smooth externally, grooved or else serrate within; back not distinctly keeled.

ANALYSIS OF SPECIES.

°. Premaxillary band of teeth with a strong backward process on each side (*Noturus*):

- a. Body elongate; head depressed, broad, and flat, nearly as broad as long; middle region of body subcylindrical; tail compressed; head about $4\frac{1}{2}$ in length; width of head $5\frac{1}{2}$; depth $5\frac{1}{2}$ in length; distance to dorsal about 3 in length; barbels, short; a strong keel on back behind dorsal, leading to adipose fin; adipose fin deeply notched; dorsal spine very short, pectoral spine retrorsely serrate in front, slightly rough or nearly entire behind; its length three times in distance from snout to dorsal; anal rays about 16; color nearly uniform yellowish-brown, in northern specimens blackish above, slightly mottled; fins yellow-edged; size very large, reaches a length of more than a foot

FLAVUS, 23.

°. Premaxillary band of teeth without lateral backward processes (*Schilbeodes*):

- f. Pectoral spine dentate-serrate behind, more or less roughened in front; adipose fin notched:
 - b. Pectoral spines shortish, nearly straight, about one-third length of head; the serratures weak, less than half the diameter of the spine; body elongated its depth $5\frac{1}{2}$ to 7 in length; the head very much depressed; anal 14 to 17; colors nearly uniform, somewhat mottled; fins more or less dark-edged.
 - c. Pectoral spine retrorse-serrate without, weakly serrate within; head very broad, flat, and thin; upper jaw projecting; head about $4\frac{1}{2}$ in length, depth 6; dorsal fin one-fourth higher than long; distance from snout to dorsal about $2\frac{1}{2}$ in length; length of pectoral spine $2\frac{1}{2}$ in same distance; dorsal much nearer anal than snout; anal rays 16 to 20; size large (reaches the length of nearly a foot); colors rather dark; dorsal and caudal fins black-margined.....INSIGNIS, 24.
 - cc. Pectoral spine slightly retrorse-serrate without, with about six small straight teeth within, which are not one-third the diameter of the spine in length; head small, not very broad, but thin and depressed; its width $5\frac{1}{2}$ to 6 in length of body; jaws nearly equal; head $4\frac{1}{2}$ in length, depth $5\frac{1}{2}$ to $6\frac{1}{2}$; dorsal scarcely higher than long; distance from snout to dorsal about $3\frac{1}{2}$ in length; pectoral spine $3\frac{1}{2}$ to 4 in this distance; dorsal spine low, nearer snout than anal; anal rays 14 or 15; size small; color pale.....EXILIS, 25.

BULL. N. M. No. 10—7

- bb. Pectoral spines extremely strong, more than half the length of head, curved; their posterior serræ strong, spine-like, hooked backward, each about as long as the diameter of the spines:
- d. Adipose fin connected with the caudal fin; distance from snout to dorsal about $2\frac{1}{2}$ in length; pectoral spine $2\frac{1}{2}$ in this distance; dorsal fin higher than long; body not very elongate nor much depressed; the dorsal region often somewhat elevated; the depth usually $4\frac{1}{2}$ to 5 in length; head $3\frac{1}{2}$ to 4; dorsal nearer anal than tip of snout; anal 12 or 13 rays; pectoral spine curved and sharply serrate without, with six strong recurved pectinations within each as long as the diameter of the spine; body much mottled, black and grayish; top of head, tip of dorsal, middle of adipose fin, and edge of caudal definitely black; body with four broad cross-blotches, one before dorsal, one behind it, one on middle of adipose fin, and one small one behind it; size small.....MIURUS, 26.
- dd. Adipose fin entirely free from caudal fin, separated from it by a space nearly equal to the diameter of the eye; spines as in *miurus* but rather weaker; head $3\frac{1}{2}$ in length; depth $5\frac{1}{2}$; distance to dorsal $2\frac{1}{2}$ in length; pectoral spine $2\frac{1}{2}$ in distance to dorsal; width of head $4\frac{1}{2}$ in length; body moderately elongated; head broad and flat, much like that of a *Pelodichthys*; anal fin with but eleven rays; color mottled gray, faintly and irregularly spotted with darker.....ELEUTHERUS, 27.
- tt. Pectoral spine entire or grooved behind, never retrorse-serrate; adipose fin continuous, not notched:
- e. Head small and narrow, longer than broad, with small eye; its length about 4 in body, its width $5\frac{1}{2}$; upper jaw much projecting; spines very short and slender, that of the dorsal not one-third the height of the fin, and all less than one-fourth the length of head; body slender, but not elongate; distance to dorsal $2\frac{1}{2}$ in length; pectoral spine 5 in this distance, slightly retrorse-serrate without, grooved within; depth $5\frac{1}{2}$ in length; dorsal nearer anal than snout; anal 14; color mottled, rather pale...LEPTACANTHUS, 28.
- ee. Head short, broad, and deep.
- f. Head shorter, narrower, and smaller in every way, than in the next, the body more elongate, more compressed but less deep, the width $4\frac{1}{2}$ in length of body; length of head $4\frac{1}{2}$; depth of body $5\frac{1}{2}$; snout to dorsal one third of length; pectoral spine $2\frac{1}{2}$ in distance to dorsal; jaws nearly equal; anal rays 15 or 16; lower barbels pale; coloration yellowish brown, with a lateral dark streak and two dorsal ones.....GYRINUS, 29.
- ff. Head $3\frac{1}{2}$ to 4 in length, larger than in any of the other species; width of head $3\frac{1}{2}$ in length; distance from snout to dorsal $2\frac{1}{2}$ in length; body comparatively short and thick, the depth 4 to 5 in length; spines stout and rather long, that of the pectoral fin straight, about half the length of head; $2\frac{1}{2}$ in distance to dorsal fin; entirely free from serratures outside, grooved within; dorsal higher than long, nearer anal than snout; anal high, of 13 rays; adipose fin high, continuous, without any notch at all; caudal fin arising very near anal; barbels short; the lower dark; color nearly uniform yellowish brown, never blotched; a narrow black lateral streak, which is usually conspicuous.....SIALIS, 30.

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25. NOTURUS FLAVUS, Rafinesque.

Yellow Stone Cat—Common Stone Cat.

(Figs. 54 and 55.)

- Noturus flavus*, RAF. (1818), Am. Monthly Mag. and Critical Review, p. 41; (1820), Ich. Oh. 68.—KIRTLAND (1838), Rept. Zool. Ohio, 169, 195; (1846), Bost. Journ. Nat. Hist. iv, 336.—STORER (1846), Synopsis, 406.—GILL (1862), Proc. Bost. Soc. Nat. Hist. 45.—COPE (1864), Proc. Acad. Nat. Sci. Phila. 277; (1869), Journ. Acad. Nat. Sci. Phila. 237.—GÜNTHER (1864), Cat. Fishes, v, 104.—UHLER & LUGGER (1876), Fishes Maryland, 151.—JORDAN (1877), Ann. Lyc. Nat. Hist. N. Y.—*Noturus luteus*, RAF. (1819), Journ. de Physique, 421.
Noturus occidentalis, GILL (1862), Proc. Bost. Soc. Nat. Hist. 45; 1876), Capt. † Simpson's Rept. 423.—JORDAN & COPELAND (1876), Check List, 160.
Noturus platycephalus, GÜNTHER (1864), Catalogue Fishes, v, 104.—JORDAN & COPELAND (1876), Check List, 160.

Habitat.—Vermont and Canada to Virginia, Ohio Valley and Missouri Region.

It is not quite certain which species served as the type of Rafinesque's "*flavus*". Three distinct species occur about the Falls of the Ohio, *flavus*, *sialis*, and *miurus*. Of these, "*flavus*" is the most abundant in the immediate neighborhood of the river, the others preferring clearer water than is found in most of the streams near the falls. Rafinesque speaks of his *flavus* as being entirely yellowish, and as reaching the length of a foot. *Miurus* is never yellowish; and neither *miurus* nor *sialis*, so far as I know, reach a length of more than six inches. Moreover, the *flavus* of Kirtland, Cope, and of most writers, is the species now under consideration.

N. occidentalis Gill I also consider the same. There is nothing in the description to indicate difference, and, on examination of specimens supposed to be the original types of *occidentalis*, I am unable to find any distinctive characters whatever. Like *Ichthaelurus punctatus* and *Amiurus lividus*, the *Noturus flavus* is a species of wide geographical range, and its occurrence in Nebraska is not surprising.

N. platycephalus Günther is evidently the same as *flavus*. *N. occidentalis* Günther is based on specimens of *Noturus marginatus*, sent by the Smithsonian Institution to the British Museum, Prof. Gill informs me.

I have examined specimens, which I refer to *flavus*, from Saint Lawrence River, New York, from Lake Champlain, from the Potomac River, from the Ohio River in West Virginia, in Ohio, and in Indiana, from the Miami, White, and Wabash Rivers, from the Missouri River, from Lake Michigan, and from Platte River.

24. NOTURUS INSIGNIS, (Richardson) Gill & Jordan.

Margined Stone Cat.

(Figs. 56 and 57.)

Pimelodon livrée, LE SUEUR (1819), Mém. du Mus. v, 155.*Pimelodus insignis*, RICHARDSON (1836), Fauna Boreali-Americana, iil, 132 (name only, based on Le Sueur's description).*Pimelodus lemniscatus*, CUV. & VAL. (1840), xv, 144.—STORER (1846), Synopsis, 405.*Noturus lemniscatus*, GIRARD (1859), Proc. Acad. Nat. Sci. 158.—GILL (1862), Proc. Bost. Soc. Nat. Hist. 45.—GÜNTHER (1864), Cat. Fishes, v, 104.—JORDAN (1876), Man. Vert. 303.—JORDAN & COPELAND (1876), Check List, 160.*Noturus occidentalis*, GÜNTHER (1864), Cat. Fishes, v, 105 (not of Gill).*Noturus marginatus*, BAIRD, MSS.—COPE (1869), Journ. Acad. Nat. Sci. Phila. 237.—COPE (1870), Proc. Am. Philos. Soc. 44.—JORDAN & COPELAND (1876), Check List, 160.—JORDAN (1876), Ann. Lyc. Nat. Hist. N. Y. —.

Habitat.—Pennsylvania to South Carolina. This species was first noted by Le Sueur under the name of *Pimelodon livrée*, but for some reason that author neglected to give it a classical name. The name of *insigne* was supplied by Richardson, and that of *lemniscatus* by Cuvier and Valenciennes. The description of the coloration is such as to leave no possible doubt of the identity of this species with Le Sueur's.

No satisfactory description of this common fish has yet been published. It is well distinguished from *miurus* and *exilis* by the characters given above in the analysis of species.

25. NOTURUS EXILIS, Nelson.

Slender Stone Cat.

(Figs. 58 and 59.)

Noturus exilis, NELSON (1876), Bull. Ills. Mus. Nat. Hist. 51.—JORDAN & COPELAND (1876), Check List, 160.—JORDAN (1877), Ann. Lyc. Nat. Hist. N. Y. —.*Habitat.*—Wisconsin and Illinois to Missouri and Kansas.

The synonymy of this species needs no remark. Its relations are entirely with *marginatus*, from which species it is undoubtedly distinct. Specimens from Wisconsin are much less elongate than Nelson's original types. I do not, however, consider them specifically distinct.

26. NOTURUS MIURUS, Jordan.

Variegated Stone Cat.

(Figs. 60 and 61.)

Noturus miurus, JORDAN, MSS.—JORDAN & COPELAND (1876), Check List, 160.—JORDAN (1877), Ann. Lyc. Nat. Hist. 46 (name only).—JORDAN (1877), Ann. Lyc. Nat. Hist. N. Y. —.*Noturus marginatus*, JORDAN (1876), Man. Vert. 303.—NELSON (1876), Bull. Ills. Mus. Nat. Hist. 50 (not of Baird).*Habitat.*—Great Lakes and Ohio Valley to Wisconsin and Louisiana.

This species, although a very abundant one in the Mississippi Valley, seems to have been entirely overlooked by our writers on Ichthyology; the great development and serration of the pectoral spines will always serve to distinguish it from all of the preceding. I have seen specimens from Louisiana as well as from various localities in the Ohio Valley and from Lake Michigan.

27. NOTURUS ELEUTHERUS, Jordan.*

Free-finned Stone Cat.

(Figs. 62 and 63.)

Noturus eleutherus, JORDAN (1877), Ann. Lyc. Nat. Hist. —.

Habitat—French Broad River, Tennessee; Tar River, North Carolina.

This fish is not a variety of *miurus*; it is either a distinct species or a very remarkable monstrosity. I think now that the former is the case, and I have designated it by the above name, in allusion to the adipose fin being free from the caudal. The type-specimen from the French Broad River very strongly resembles a young *Pelodichthys*, but has the upper jaw longer. The adipose fin is, as usual, decurrent, but it is entirely separate from the beginning of the caudal.

**Noturus eleutherus*, JORDAN.—Since the first part of this paper was printed, I have been able to examine a large number of fine specimens collected by Mr. J. W. Milner, of the United States Fish Commission, in the Tar River near Tarboro', N. C. These specimens show the following characters:—

Body stout, broad forward, tapering behind. Head large, flattish, $4\frac{1}{2}$ in length of body, without caudal; depth of body $5\frac{1}{2}$ in length; width of head $4\frac{1}{2}$ in length of body. Mouth large, the upper jaw much projecting; barbels rather long. Adipose fin rather high, so deeply notched that the continuity of the fin is broken for a distance nearly equal to the diameter of the eye. A strong keel on the back in front of the adipose fin. Caudal fin rounded. Distance from snout to dorsal 3 in length of body. Pectoral spine in this distance 2 times, in head $1\frac{1}{2}$. Dorsal spine $\frac{3}{4}$ the height of the fin, $3\frac{1}{2}$ times in distance from snout to dorsal, $2\frac{1}{2}$ in length of head. Pectinations of pectoral spine very strong, recurved, nearly as long as the diameter of the spine. Front of pectoral spine with small teeth turned forward. Fin-radii: D. 1, 7; A. 12; P. 1, 8; V. 9. Color much as in *N. miurus*, extensively variegated. Snout, cheeks, and occipital region black. A black bar across front of dorsal, one behind dorsal, and another across middle of adipose fin; base of caudal fin black. One or two narrow horizontal black bars across dorsal and anal near their tips. Caudal vaguely barred, largely black, its tip white. Length of specimens $4\frac{1}{2}$ inches.

This is one of the most striking of our *Siluridæ*. Its relations are with *N. miurus* but the nearly free adipose fin will always serve to distinguish it. I have seen no specimens of *miurus* so large and stout as these of *eleutherus*.

28. NOTURUS LEPTACANTHUS, *Jordan*.

Weak-spined Stone Cat.

(Figs. 64 and 65.)

Noturus leptacanthus, JORDAN (1876), MSS.—JORDAN & COPELAND, Check List, 160 (name only).—JORDAN (1877), Ann. Lyc. Nat. Hist. —.

Habitat.—Etowah River, Georgia.

But a single specimen of this species is known; it is, however, totally distinct from all the rest; its relations are chiefly with *gyrinus*.

29. NOTURUS GYRINUS, (*Mitchill*) *Rafinesque*.

Tadpole Stone Cat.

(Fig. 66 and 67.)

Silurus gyrimus, MITCHILL (1818), Am. Monthly Mag. March, 322.—DE KAY (1842), Fishes N. Y. 186.

Noturus gyrimus, RAF. (1819), Journ. de Physique, 421; (1820), Ich. Ob. 68.—GILL (1862), Proc. Bost. Soc. Nat. Hist. 45.—COPE (1869), Journ. Acad. Nat. Sci. Phila. 237.—JORDAN (1876), Man. Vert. 303.—JORDAN & COPELAND (1876), Check List, 160.—JORDAN (1877), Ann. Lyc. Nat. Hist. —.

Schilbeodes gyrimus, BLEEKER (1858), l. c.

Habitat.—Southern New York to Pennsylvania.

I have examined specimens of this species from Orange, Rockland, and Chemung Counties, New York. It resembles the next, but is in every way slenderer and weaker.

30. NOTURUS SIALIS, *Jordan*, sp. nov.

Chubby Stone Cat.

(Figs. 68 and 69.)

Noturus flavus, JORDAN (1876), Man. Vert. 303 (in part).—NELSON (1876), Bull. Ill. Mus. Nat. Hist. 50.—JORDAN (1877), Proc. Acad. Nat. Sci. Phila. 46.

Habitat.—Entire Mississippi Valley, Great Lake Region, and in Red River of the North.

Comparison of eastern and western specimens referred to *gyrinus* show surprising differences of form, and as these differences appear to be constant in a great number of specimens examined from widely separated localities, I have decided to separate the western form as a distinct species.

The eastern form, or *gyrinus*, has the head shorter and every way smaller, and the body proper more elongate, more compressed, almost ribbon-shaped, and the spines rather weaker. The coloration is the

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same in both, yellowish-brown, with a lateral dark streak and two more dorsal ones. The lower barbels are usually dark in *sialis*, pale in *gyrinus*. The outline drawings of the two which accompany this paper shows the differences better than they can be expressed in words.

Noturus gyrinus is apparently a starved representative of *Noturus sialis* as *N. exilis* is of *N. insignis*, but in the latter case the "starved" form is the western one.

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BIBLIOGRAPHY.

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CATESBY (Mark). The Natural History of Carolina, Florida and the Bahama Islands: containing The Figures of Birds, Beasts, Fishes, Serpents, Insects and Plants: Particularly the Forest Trees, Shrubs and other Plants not hitherto described or very incorrectly figured by Authors. Together with their Descriptions in English and French. To which is added, Observations on the Air, Soil and Waters: with Remarks upon Agriculture, Grain, Pulse, Roots, etc. To the whole is Prefixed a new and correct Map of the Country Treated of. By Mark Catesby, F. R. S. London . . . , MDCCXXXI-XLIII. 2 vols. folio.

[Contains a description and an outrageous figure of a Catfish from South Carolina. The figure is not identifiable, but has served as the basis of the earlier accounts of *Silurus catus*.]

LINNÉ (Carl von). Caroli Linnei Equitis De Stella Polari, Archiatri Regii, Med. et Botan. Profess. Upsal; Acad. Upsal. Holmens. Petropol. Berol. Imper. Lond. Monspel. Tolos. Florent. Soc. Systema Naturæ per Regna Tria Naturæ, secundum Classes, Ordines, Genera, Species, cum Characteribus, Differentiis, Synonymis, Locis.—Editio Decima, Reformata. Cum Privilegio Sæc. Ræc. Mitis Sueciæ.—Holmiæ, Impensis Direct. Laurentii Salvii 1758. Tomus I, Regnum Animale.

[Describes sp. n. *Silurus catus*.]

BLOCH (Mark Elieser) and SCHNEIDER (Johann Gottlob). M. E. Blochii Doctoris Medicinæ Berolinensis, et societatis literariis multis adscripti, Systema Ichthyologiæ iconibus CX illustratum.—Post obitum auctoris opus inchoatum absolvit, correxit, interpolavit Jo. Gottlob Schneider, Saxo.—Berolini, sumptibus Auctoris impressum et bibliopolo Sanderiano commissum, 1801.

[Describes *Silurus catus* Linnaeus, adding to Linnaeus's account the characters "caudali pinnæ bifurcæ: dorsali et pectorali inermi, omnibus obscure rubentibus" from Catesby's figure.]

MITCHELL (Samuel Latham). Memoir on Ichthyology. The Fishes of New York described and arranged. In a supplement to the Memoir on the same subject, printed in the New York Literary and Philosophical Transactions, vol. i, pp. 355, 492. By Samuel L. Mitchell. < The American Monthly Magazine and Critical Review, vol. ii, (New York), pp. 241-242, 321-328, 1818.

[Description of *Silurus gyrisus* sp. nov.]

RAFINESQUE (Constantine Samuel). Discoveries in Natural History, made during a Journey through the Western Region of the United States by Constantine Samuel Rafinesque, esq. Addressed to Samuel L. Mitchell, President, and other members of the Lyceum of Natural History in a letter dated at Louisville, Falls of the Ohio, 20th July, 1818. < American Monthly Magazine and Critical Review, New York, September, 1818.

[Describes *Silurus punctatus andolevargi* sp. nov.]

RAFINESQUE (Constantine Samuel). Farther account of Discoveries in Natural History in the Western States, by Constantine Samuel Rafinesque, esq. Communicated in a letter from that gentleman to the editor, Lexington, October 5, 1818. < American Monthly Magazine and Critical Review, November, 1818.

[Describes *Noturus flavus* gen. et sp. nov.]

— Prodrôme de 70 nouveaux Genres d'Animaux découverts dans l'intérieur des États-Unis d'Amérique durant l'année 1818. < Journal de Physique, de Chimie et d'Histoire Naturelle, Paris, June, 1819.

[Describes *Noturus luteus* and *Pseudictis limosus* gen. et sp. nov.]

LE SUEUR (Charles A.). Notice de quelques Poissons découverts dans les lacs du Haut-Canada, durant l'été de 1816, par Ch. A. Le Sueur. < Mémoires du Muséum d'Histoire Naturelle, Paris, 1819, tome cinquième.

[Describes sp. nov. *Pimelodus albidus*, *P. nebulosus*, *P. aeneus*, *P. caudafurcatus*, *P. nigricans*, *P. natalis*, and (without Latin name) *Pimelodon livide* (= *P. insignis* Rich., *P. lemniscatus* C. & V.).]

RAFINESQUE (Constantine Samuel). Description of the Silures or Cat-Fishes of the River Ohio, by C. S. Rafinesque, Professor of Botany in the Transylvania University of Lexington, Kentucky. < Quarterly Journal of Science, Literature and Arts, Royal Institution, London, 1820, ix.

[Describes the following new species and varieties:—*Silurus maculatus* (= *S. punctatus*, 1818); var. *erythroptera*; *S. pallidus*; var. *marginatus*; var. *lateralis*; var. *leucoptera*; *S. cerulescens*; var. *melanurus*; *S. argentinus*; *S. nebulosus* (= *S. olivaceus*, 1818); *S. viscosus*; *S. lividus*; var. *fuscatus*; *S. melas*; *S. ouprens*; *S. zanthocephalus*; and *S. limosus*.]

— Ichthyologia Ohienensis or Natural History of the Fishes Inhabiting the River Ohio and its Tributary Streams. Preceded by a physical description of the Ohio and its branches by C. S. Rafinesque, Professor of Botany and Natural History in Transylvania University, Author of the Analysis of Nature, &c., &c., member of the Literary and Philosophical Society of New York, the Historical Society of New York, the Lyceum of Natural History of New York, the Academy of Sciences of Philadelphia, the American Antiquarian Society, the Royal Institute of Natural Sciences of Naples, the Italian Society of Arts and Sciences, the Medical Societies of Lexington and Cincinnati, &c., &c.—The art of seeing well, or of noticing and distinguishing with accuracy the objects which we perceive is a high faculty of the mind, untold in few individuals, and despised by those who can neither acquire it, nor appreciate its results.—Lexington, Kentucky, printed for the Author by W. G. Hunt (price one dollar).—1820. (1 vol., 8vo, 90 pp.)

[Originally printed in the Western Review and Miscellaneous Magazine, Lexington, Kentucky, 1819-20. It contains redescription of all the species previously indicated by the author, thirteen in number; the name *S. argentinus* is changed to *Pimelodus argyrus*, and the genus *Pimelodus* is divided into a number of subgenera and sections: *Ictalurus*, *Ellipses*, *Leptops*, *Oplodactis*, *Ameiurus*, *Thictis*, etc.]

— Extracts from A Second Series of Zoological Letters written to Baron Cuvier of Paris, by Prof. Rafinesque in 1831. < Atlantic Journal and Friend of Knowledge, Philadelphia, 1832, pp. 19-22.

[Describes numerous shells, worms, "Percostomes", etc. I copy the part relating to fishes for the edification of ichthyologists:—

"I send you, as you request, the figure, description, and a specimen of my *Trinectes* Soabro, a new G. of fish near to *Achirus* found in the River Schoenkill; it has only three line: dorsal and anal and caudal. "Also the description and figure of a large and beautiful new catfish from the River

"This name is very good, but if not agreeable to all, I have half a dozen others to offer as substitutes: *Biopores*, or *Zoopores*, or *Leptomes*, or *Adelostomes*, &c. Because it is my wish that this class of large section of animals should bear a good name given by me, instead of the delusory one of *Animalcula* or *microscopic animals*, which does not apply to all. . . . The *Miasmata* or miasmatic animals of the air, may be the invisible birds of this class, or aerial insects floating in the air."—(EAT. op. cit., p. 21.)

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Tennessee discovered in 1823. *Pimelodus lutescens*: it was three feet long, excellent to eat, of a olivaceous yellow colour, belly white, jaws equal, eyes round, tail forked, first dorsal falciform, second dorsal nearly as large as the anal."—(RAF., l. c., p. 20.)

"I send you also the figures and descriptions of five new fishes No. 3 to 7. *Zonipus punctatus*, *Semotilus notatus*, *Lepemius fasciatus* and *bi.ineatus*, *Luxilus auratilis* and *Zonargyrea virescens*. All observed in the waters of Kentucky since publishing my Ichthyology of the Ohio in 1820, except the *Lepemius*."—(RAF., l. c., p. 22.)

RICHARDSON (John). Fauna-Boreali-Americana; or the Zoology of the Northern Parts of British America containing descriptions of the objects of Natural History collected on the late Northern Land Expeditions under command of Captain Sir John Franklin, R. N. Part third. The Fish. By John Richardson, M. D., F. R. S., F. L. S., Member of the Geographical Society of London, and Wernerian Natural History Society of Edinburgh; Honorary Member of the Natural History Society of Montreal, and Literary and Philosophical Society of Quebec; Foreign Member of the Geographical Society of Paris; and Corresponding Member of the Academy of Natural Science of Philadelphia; Surgeon and Naturalist to the Expeditions.—Illustrated by numerous plates.—Published under the authority of the Right Honorable the Secretary of State for Colonial Affairs.—London: Richard Bentley. New Burlington Street—MDCCCXXXVI.

[Describes n. sp. *Silurus (Pimelodus) canosus* and *S. (P.) borealis*; also *P. nigricans* Le Sueur called by error "*S. (P.) nigrescens*"; and refers to the "*Pimelodon livideus*" of Le Sueur as *Pimelodus insignis*.]

STORER (David Humphreys). A Report on the Fishes of Massachusetts. By D. Humphreys Storer, M. D. < Boston Journal of Natural History, vol. ii, 1839, pp. 289-558.

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CUVIER (Georges Chrétien Leopold Dagobert) and VALENCIENNES (Achille). Histoire Naturelle des Poissons par M. le B.^{on} Cuvier, Pair de France, Grand Officier de la Légion d'honneur, Conseiller de l'Etat et aux Conseil royal de l'Instruction publique, l'un des quarante de l'Académie française, Associé libre de l'Académie des Belles-Lettres, Secrétaire perpétuelle de celle des Sciences, Membre des Sociétés et Académies royales de Londres, de Berlin, de l'étersbourg, de Stockholm, de Turin, de Göttingue, des Pays-Bas, de Munich, de Modène, etc.; et par M. A. Valenciennes, Professeur de Zoologie au Muséum d'Histoire naturelle, Membre de l'Académie royale des Sciences de Berlin, de la Société Zoologique de Londres, etc. Tome quinzième. À Paris, chez Ch. Pitois, éditeur, rue de la Harpe, n^o 81. Strasbourg, chez V^e. Lévrault, rue des Juifs, n^o 33, 1840.

[Contains descriptions of sp. nov. *Pimelodus punctulatus*, *P. furcatus*, *P. furcifer*, *P. lemniscatus* (P. livide, Le S.), and accounts of seven previously described American species, viz. *P. catus*, *canosus*, *borealis*, *albidus*, *nebulosus*, *nigricans*, and *canus*.]

THOMPSON (Zadock). History of Vermont, natural, civil, and statistical. Burlington, Vermont, 1843.

[Contains description of n. sp. *Pimelodus vulgaris*, considered as doubtfully new, and descriptions and small figures of two or three other species.]

DEKAY (James E.). Zoology of New York, or the New York Fauna; comprising detailed descriptions of all the animals hitherto observed within the State of New York, with notices of those occasionally found near its borders and accompanied by appropriate illustrations. By James E. Dekay. Part iv. Fishes.—Albany: printed by W. & A. White & J. Vlascher, 1842.

[Describes sp. n. *Pimelodus atrarius* and *P. pullus*; also describes *P. nigricans* and *P. catus*, with notices of various other species.]

KIRTLAND (Jared Potter). Description of the Fishes of Lake Erie, the Ohio River, and their Tributaries. By Jared P. Kirtland, M. D. < Boston Journal of Natural History, v, pp. 330-336 (*Siluridae*), 1846.

[Describes *Pimelodus nebulosus*, *P. nupreus*, *P. carulescens*, *P. limosus*, and *Noturus flavus*. The descriptions are rather unsatisfactory, as the author confounds two or more distinct species under some of the above names. The description of *P. carulescens*, for example, chiefly refers apparently to *Amiurus nigricans*, the anal fin is that of *Ichthaelurus robustus*, the figure of the adult represents *A. nigricans*, while that of the young is *Ichthaelurus punctatus*. The figure of *Pimelodus nebulosus* represents *Amiurus xanthocephalus*, while the description applies to either.]

STORER (David Humphreys). A Synopsis of the Fishes of North America, by David Humphreys Storer, M. D., A. A. S., Vice-president of the Boston Society of Natural History; Member of the American Philosophical Society, Corresponding Member of the Academy of Natural Sciences of Philadelphia, etc. Cambridge: Metcalf & Company, Printers to the University. 1846. (Reprinted from Memoirs of the American Academy, ii, 1846.)

[Contains descriptions of seventeen species, chiefly compiled from the accounts given by Cuvier and Valenciennes and Dr. Kirtland.]

AGASSIZ (Louis). Lake Superior: its Physical Character, Vegetation, and Animals compared with those of other and similar regions, by Louis Agassiz, with a narrative of the tour by J. Elliott Cabot, and contributions by other scientific gentlemen. Elegantly illustrated. Boston: Gould, Kendall and Lincoln, 59 Washington Street. 1850.

[Describes *Pimelodus felis* Ag., sp. nov., and outlines a division of the genus *Pimelodus* into several genera.]

HOUGH (Franklin B.). Fifth Annual Report of the Regents of the University of the State of New York on the Condition of the State Cabinet of Natural History, and the historical and antiquarian collection annexed thereto. Albany: C. Van Benthuysen, printer to the Legislature. 1852.

[Description of *Pimelodus gracilis*, sp. nov.]

BAIRD (Spencer Fullerton) and GIRARD (Charles). Description of New Species of Fishes collected in Texas, New Mexico and Sonora by Mr. John H. Clark on the United States and Mexican Boundary Survey and in Texas by Capt. Stewart Van Vliet, U. S. A., by S. F. Baird and Charles Girard. < Proceedings of the Academy of Natural Sciences, Philadelphia, vol. vii, 1854, pp. 24-29.

[Description of *Pimelodus affinis* sp. nov. This species is here stated to be a very near affine of *Pimelodus carulescens*. From old labels in the museum, it appears that the species called by me *Ichthaelurus furocatus* was identified by Dr. Girard with *Pimelodus carulescens*, while the *Pimelodus furocatus* of Girard is what I call *Ichthaelurus punctatus*.]

HOLBROOK (John Edward). An account of several species of Fish observed in Florida, Georgia, &c. By John Edward Holbrook, M. D., Professor of Anatomy, &c., Charleston, S. C. < Journal of the Academy of Natural Sciences, Philadelphia, vol. iii, second series, pp. 47-58, 1855.

[Description and figure of *Amiurus marmoratus*.]

STORER (David Humphreys). A History of the Fishes of Massachusetts. By David Humphreys Storer. < Memoirs of the American Academy of Arts and Sciences (Boston), new series. (1853 to 1867.)

[Description and good figure of *Pimelodus atrarius*.]

GIRARD (Charles). Notes on various New Genera and New Species of Fishes in the Museum of the Smithsonian Institution and Collected in Connection with the United States and Mexican Boundary Survey, Major William Emory, Commissioner. By Charles Girard, M. D. < Proceedings of the Academy of Natural Sciences of Philadelphia, 1858, pp. 167-171.

[Description of *Pimelodus vulpes* sp. nov.]

GIRARD (Charles). Mississippi. M. D.,—tain the Mississippi.

[Description of *Amiurus*, with

BLEEKER (Gerrit). < Acta Societatis Scientiarum (Charact. Mitthill.)

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— Ichthyologist of Natural History [Describes *P. puma*, *P. Sueur* to the The description of *Amiurus* are, ho

GILL (Theodore). By Theo. Gill, pp. 45-48, 1852. [Description of

ABBOTT (Charles). Kansas. B. ences of Philadelphia [Description of

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GÜNTHER (Alfred). Günther, M. D. of the trustee [Describes 18 *platycephalus*.]

COPE (Edward). < Proceedings 231-233. [Description of

GIRARD (Charles). Explorations and Surveys for a Railroad Route from the Mississippi River to the Atlantic Ocean. War Department.—Fishes: By Charles Girard, M. D.—Washington, D. C. 1858. <Reports of Explorations and Surveys to ascertain the most practicable and economical route for a Railroad Route from the Mississippi River to the Pacific Ocean, vol. x.

[Describes sp. nov. *Pimelodus catulus*, *P. felinus*, *P. antoniensis*, *P. ailurus*, *P. lupus*, and *P. olivaceus*, with figures of *catulus*, *ailurus* and *olivaceus*.]

BLEEKER (Pieter von). Ichthyologie Archipelagi Indici Prodromus, vol. I. Siluri. <Acta Societatis Scientiarum Indo-Nederlandicæ, vol. iv, 1858.

[Characterizes a new genus *Schilbeodes*, based on supposed characters of *Silurus gyrintus* Mitchill.]

GIRARD (Charles). United States and Mexican Boundary Survey, under the order of Lieut. Col. W. H. Emory, Major First Cavalry and United States Commissioner.—Ichthyology of the Boundary, by Charles Girard, M. D. <United States and Mexican Boundary Survey, vol. II, part I, 1859.

[Describes and figures *Pimelodus agilis* and *P. vulpes*.]

— Ichthyological Notices by Charles Girard, M. D. <Proceedings of the Academy of Natural Sciences of Philadelphia, 1859, vol. xi, pp. 157-161.

[Describes sp. nov. *Pimelodus houghti*, *P. hoyi*, *P. confinis*, *P. cyprooides*, *P. deKayi*, *P. lynx*, *P. puma*, *P. vulpeculus*, *P. platycephalus*, *P. megalops*, and *P. gracior*; refers *P. lemniscatus* Lo Suer to the genus *Noturus*; and describes a *P. catus*, supposed to be *Silurus catus* of Linnæus. The descriptions in this paper are short, unsatisfactory, and often inaccurate. The type-specimens are, however, still preserved.]

GILL (Theodore Nicholas). Description of a new genus of Pimelodinae from Canada. By Theo. Gill. <Annals of the Lyceum of Natural History of New York, vol. vii, pp. 45-48, 1859.

[Description of *Synechoglanis bealei*, gen. et sp. nov.]

ABBOTT (Charles Conrad). Descriptions of two new species of Pimelodus, from Kansas. By Charles C. Abbott. <Proceedings of the Academy of Natural Sciences of Philadelphia, 1860, pp. 568-569.

[Descriptions of *Pimelodus hammondi* and *P. notatus* sp. nov.]

GILL (Theodore Nicholas). Description of new species of Pimelodinae (abridged from the forthcoming Report of Captain J. H. Simpson) by Theodore Gill. <Proceedings of the Boston Society of Natural History, vol. viii, pp. 42-46, April, 1861.

[Describes n. sp. *Italurus simpsoni*, *Amiurus obesus*, and *Noturus occidentalis*, and gives a catalogue of the species described from the fresh waters of America.]

— Synopsis of the genera of the subfamily of Pimelodinae. By Theodore Gill. <Proceedings of the Boston Society of Natural History, vol. viii, pp. 46-55, April, 1861.

[Characterizes the genera.]

GÜNTHER (Albert). Catalogue of the Fishes in the British Museum. By Albert Günther, M. A., Ph. D., F. Z. S., etc., etc. Volume fifth. London: printed by order of the trustees. 1864.

[Describes 18 nominal species and enumerates 20 more; sp. n. *Amiurus meridionalis* and *Noturus platycephalus*.]

COPE (Edward Drinker). On a blind Silurid, from Pennsylvania, by E. D. Cope. <Proceedings of the Academy of Natural Sciences of Philadelphia, 1864, pp. 231-233.

[Description of *Grenias nigritabris* gen. et sp. nov.]

COPE (Edward Drinker). On the Distribution of Fresh Water Fishes in the Alleghany Region of South-Western Virginia. By E. D. Cope, A. M. < Journal of the Academy of Natural Sciences of Philadelphia, new series, vol. vi, part iii, January, 1869, pp. 207-247.

[First description of *Noturus marginatus* Baird, analysis of species of *Noturus*, and notices of *Hoplostetodon olivaceus* and *Ichthyolurus coccineus*.]

GÜNTHER (Albert). An Account of the Fishes of the States of Central America based on Collections made by Capt. J. M. Dow, F. Godman, Esq., and O. Salvin, Esq. By Albert Günther, M. A., M. D., Ph. D., F. R. S., F. Z. S. < Transactions of the Zoological Society of London, vol. vi, 1869, pp. 377-494.

[Description and figure of *Amiurus meridionalis*.]

STAUFFER (Jacob). In "Mombert's History of Lancaster County, Pennsylvania, 1869, p. 578" (*vide* Cope).

[Descriptions of *Ictalurus keviniskii* and *I. macaskeyi* sp. nov.]

COPE (Edward Drinker). Partial Synopsis of the Fishes of the Fresh Waters of North Carolina, by Edw. D. Cope, A. M. < Proceedings of the American Philosophical Society of Philadelphia, 1870, pp. 448-495.

[Describes sp. nov. *Amiurus missillensis*, *A. lophius*, and *A. niveiventris*, with an analysis of the species of *Amiurus* and notes on some other species.]

JORDAN (David Starr). Manual of the Vertebrates of the Northern United States, including the district east of the Mississippi River, and north of North Carolina and Tennessee, exclusive of marine species. By David Starr Jordan, M. S., M. D., Professor of Natural History in N. W. C. University, and in Indiana State Medical College. Chicago: Jansen, McClurg & Company. 1876.

[Describes briefly 23 species.]

JORDAN (David Starr) and COPELAND (Herbert Edson). Check List of the Fishes of the Fresh Waters of North America, by David S. Jordan, M. S., M. D., and Herbert E. Copeland, M. S. < Bulletin of the Buffalo Society of Natural Sciences, ii, 1876, pp. 133-164.

[48 nominal species enumerated.]

UHLER (P. R.) and LUGGER (Otto). List of Fishes of Maryland, by P. R. Uhler and Otto Lugger. < Report of the Commissioners of Fisheries of Maryland, pp. 67-176. (1876.)

[Descriptions of *Noturus flavus*, *Amiurus catus*, and *A. lynx*.]

NELSON (Edward W.). A Partial Catalogue of the Fishes of Illinois, by E. W. Nelson. < Bulletin of the Illinois Museum of Natural History, i, 1876.

[Description of *Noturus exilis* sp. nov., and notes on other species.]

GILL (Theodore Nicholas). Engineer Department, U. S. Army. Explorations across the Great Basin of Utah in 1859. In charge of Capt. J. H. Simpson, Topographical Engineers.—Report on Ichthyology. By Prof. Theo. Gill.—Washington: Government Printing Office. 1876.

[Full description and figures of *Ictalurus simpsoni*, *Amiurus obesus*, *Noturus occidentalis*, and *Hoplostetodon olivaceus*, with full synonymy and characterization of the genera.]

JORDAN (David Starr). A Partial Synopsis of the Fishes of Upper Georgia, by David S. Jordan, M. D. < Annals New York Lyceum of Natural History, 1877, pp. —

[Describes n. sp. *Amiurus brunneus*, *Noturus leptacanthus*, *N. miurus*, and *N. cleutherus*.]

— Review of Rafinesque's Writings on the Fresh Water Fishes of North America, by David S. Jordan. < Bulletin United States National Museum, ix, 1877.

[Contains identifications of the various species described by Rafinesque.]

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3. Ichth

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7. Ichth

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10. Amiurus

11. Amiurus

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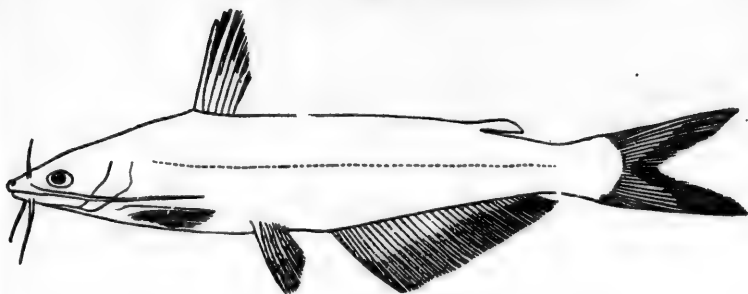


FIG. 1.—*Ichthaelurus furcatus* (C. & V.) Gill.
Texas. From types of *affinis*.

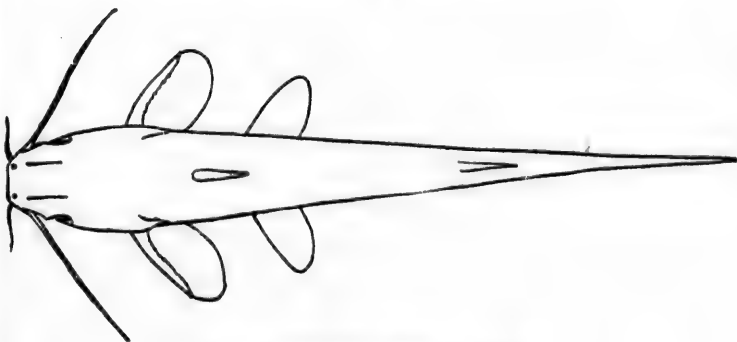


FIG. 2.—*Ichthaelurus furcatus* (C. & V.) Gill.
Texas. From types of *affinis*.

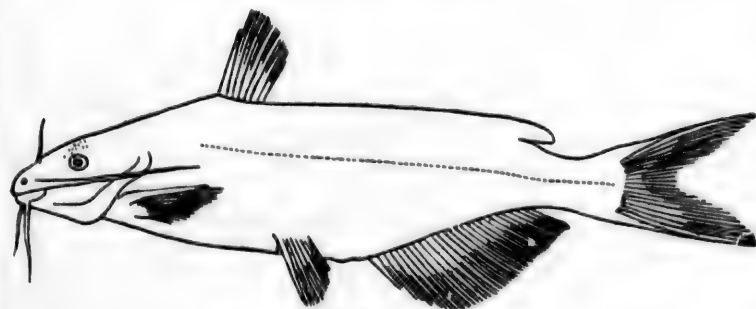


FIG. 3.—*Ichthaelurus robustus* (Jordan.)
(From type.)



PLATE 2.

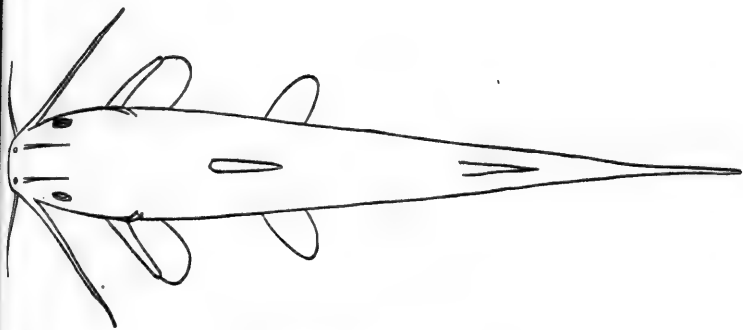


FIG. 4.—*Ichthaelurus robustus* (Jordan.)
(From type.)

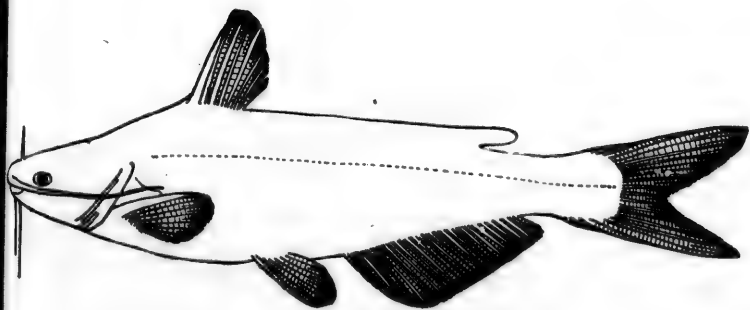


FIG. 4 (b).—*Ichthaelurus robustus* (Jordan.)
Illinois River. Reduced one-half.

Lower jaw.

Fig. 5.—*Ichthyophagus punctatus* (Bog.) Jor.
Chattahoochee R., Ga. Reduced one-half.

PLATE 3.

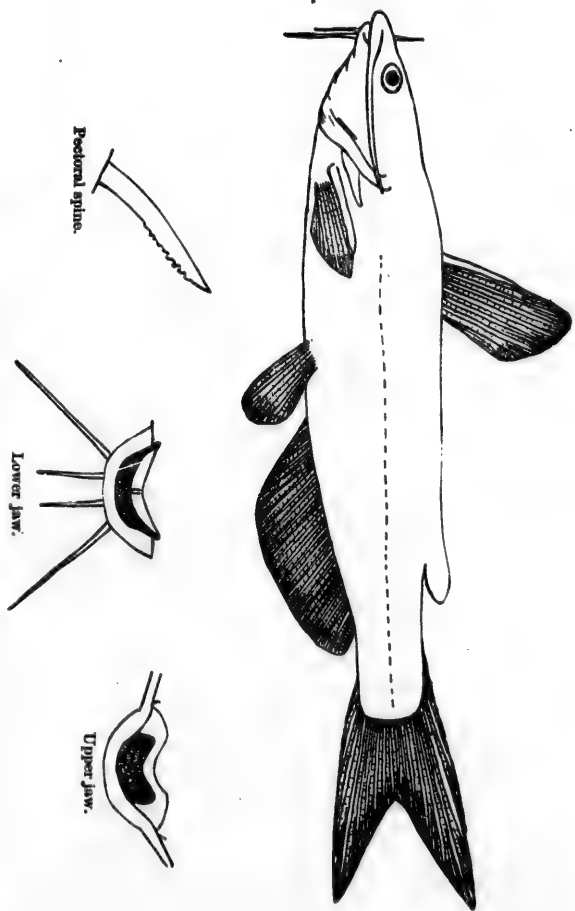


FIG. 5.—*Ichthyolum punctatus* (Raf.) for
Chittinoochee R., Ga. Reduced one-half.

Fig. 7.—*Icthyophaga meridionalis*, (Ghr.) Jac.
Central America.
(From Gunther's figure.)



Fig. 8.—*Icthyophaga meridionalis* (Ghr.) Jac.
Central America.
(From Gunther's figure.)



PLATE 4.



FIG. 7.—*Ichthyurus meridionalis*, (Gün.) Jac.
Central America.
(From Günther's figure.)

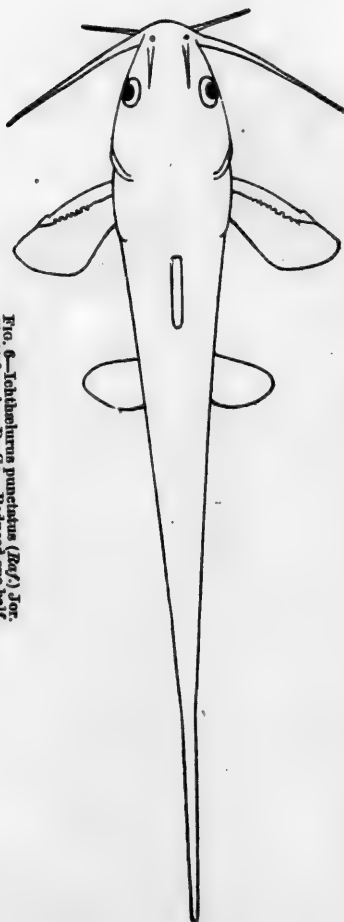


FIG. 6.—*Ichthyurus punctatus* (Baf.) Jac.
Chattahoochee R., Ga. Reduced one-half.



FIG. 8.—*Ichthyurus meridionalis* (Gün.) Jac.
Central America.
(From Günther's figure.)



PLATE 3.

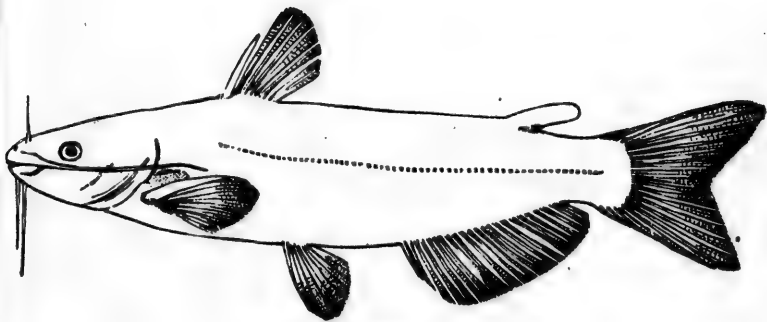


FIG. 9.—*Amiaurus lupus* (Grd.) Gthr.
Texas. (From type.)

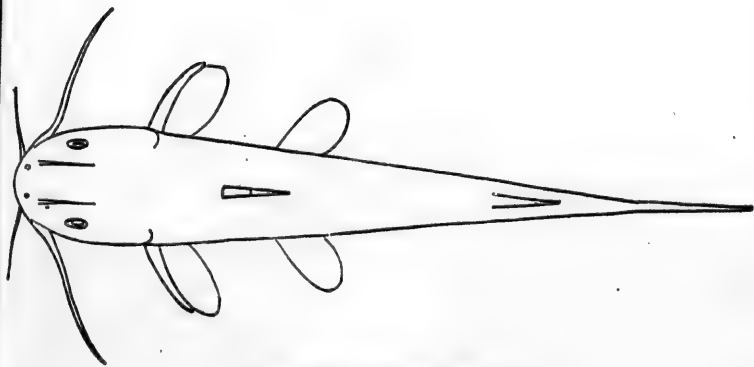


FIG. 10.—*Amiaurus lupus* (Grd.) Gthr.
Texas. (From type.)



PLATE 6.

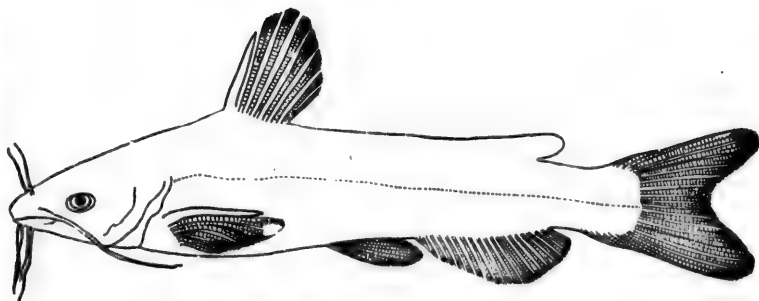


FIG. 11.—*Aplocheilichthys niveiventris* (Cope.)
Neuse River. (From type.) Reduced.

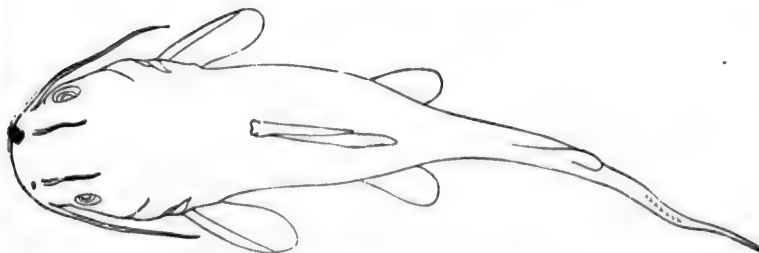


FIG. 12.—*Amiurus niveiventris* (Cope.)
Neuse River. (From type.) Reduced.

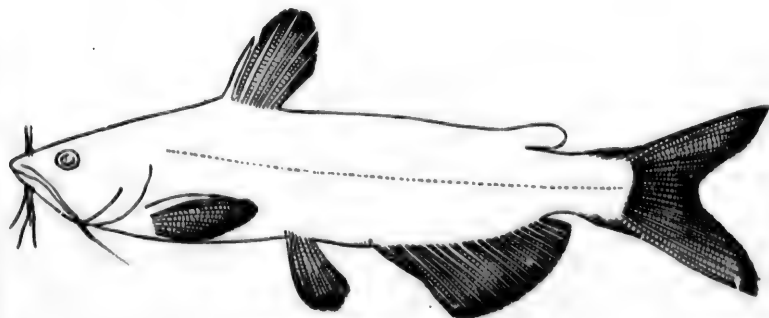
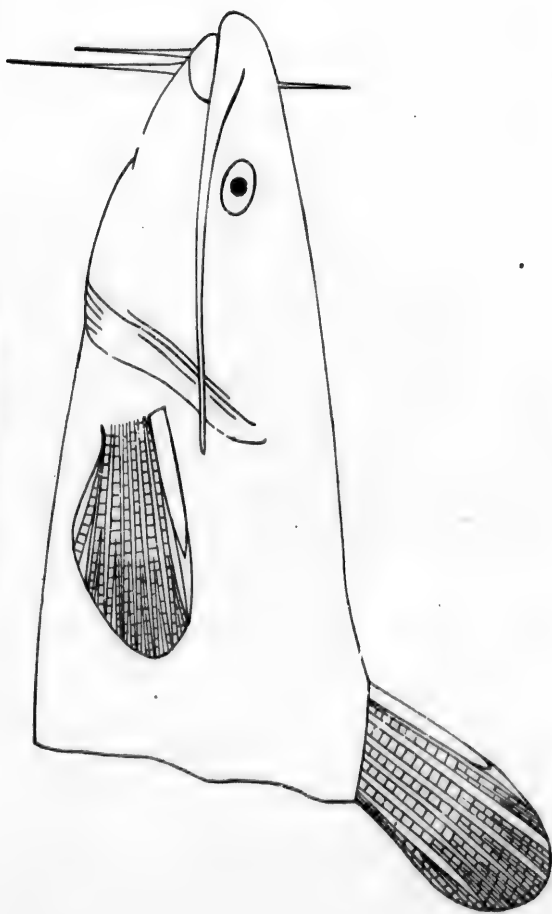


FIG. 13.—*Amiurus nigricans* (Zs. S.) Gill.
Lake Erie.

Fig. 14 (b) - *Anthus nigricans* (L. & G.) OHL.
Ohio R., Leavenworth, Ind. Reduced one-half.

PLATE 7.



No. 14 (♂).—*Amblyra septentrionalis* (L. & G.) Gill.
Ohio R., Leesport, Ind. Horizontal one-half.



PLATE 8.

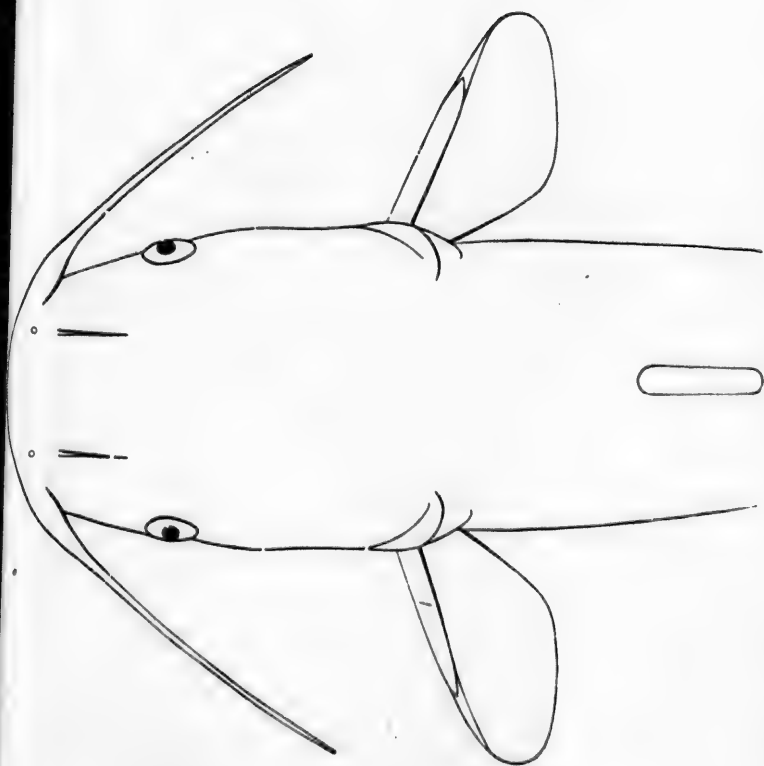
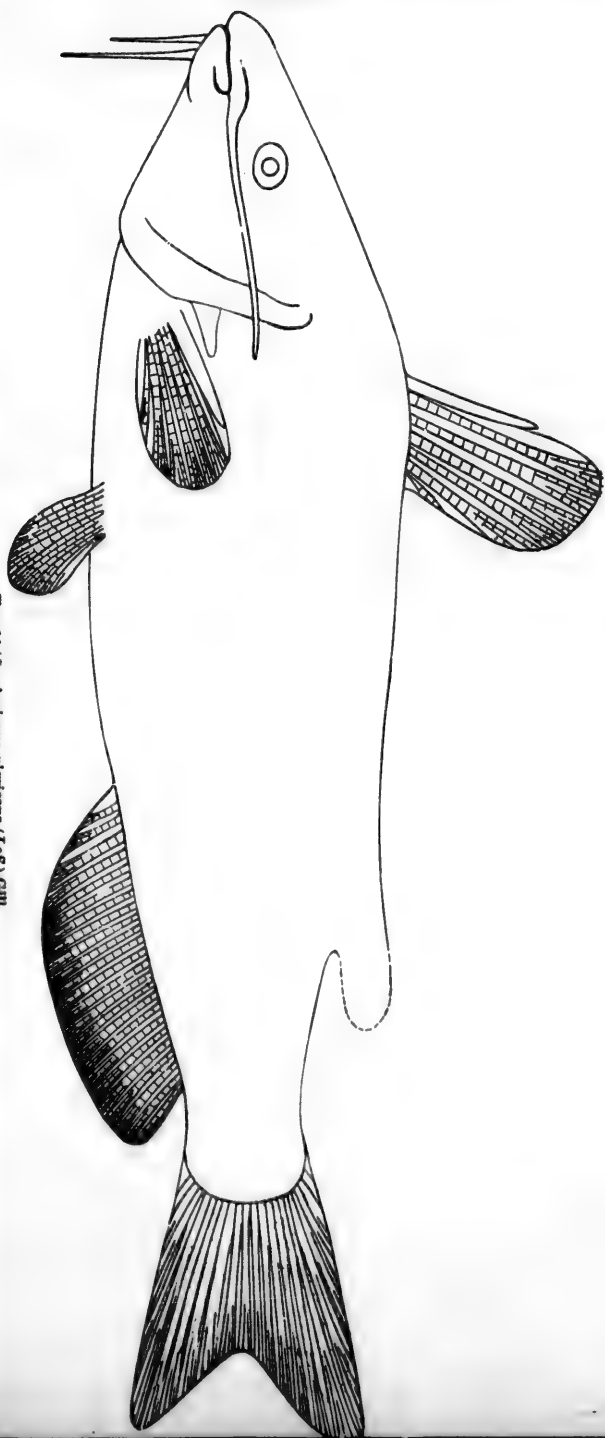


FIG. 14 (c)—*Amiurus nigricans* (L. S.) Gill.
Ohio R., Leavenworth, Ind. Reduced one-half.



FIG. 14 (2).—*Ambrus nigrum* (L.S.) GIL.
Florida. (From a mounted skeleton.)

PLATE 9.



**FIG. 14 (2).—*Amiurus nigricans* (L&S.) GILL.
Florida. (From a mounted skeleton.)**



Fig. 16. *Amphyrus albidus* (Zs. & G.M.).
Pronotum II. Head and thorax.

PLATE 10.

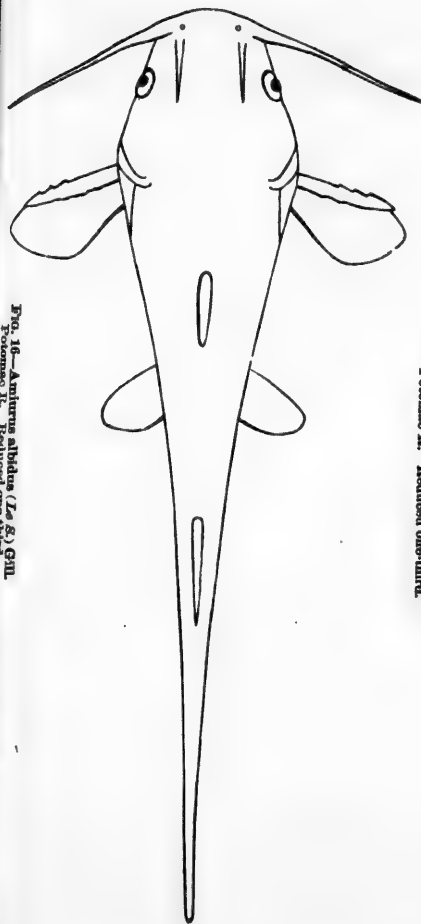


FIG. 16.—*Anilurus albidus* (Z. S.) GILL.
Potomac R. Reduced two-thirds.

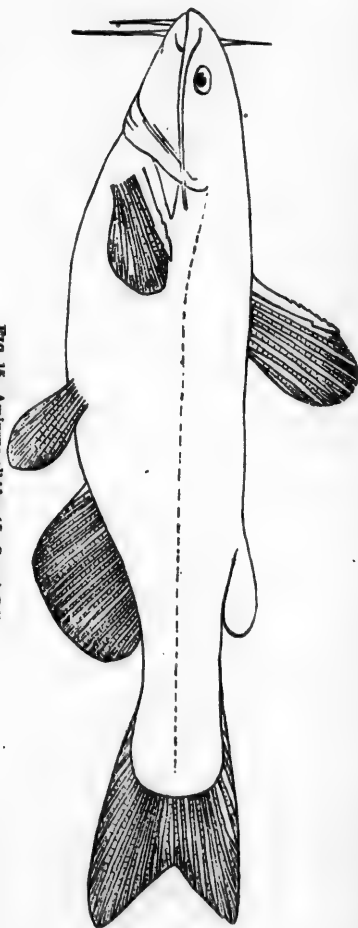


FIG. 18.—*Anilurus albidus* (Z. S.) GILL.
Potomac R. Reduced one-third.

PLATE II.

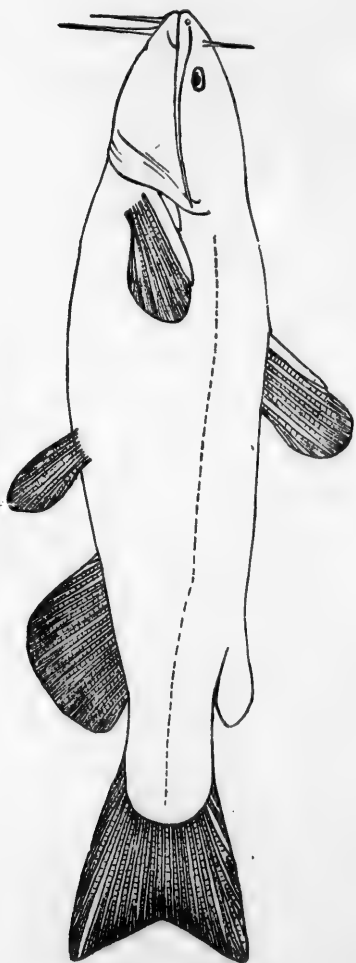


FIG. 17.—*Amurru phius* (Cope)
Potomac River. Reduced one-half.

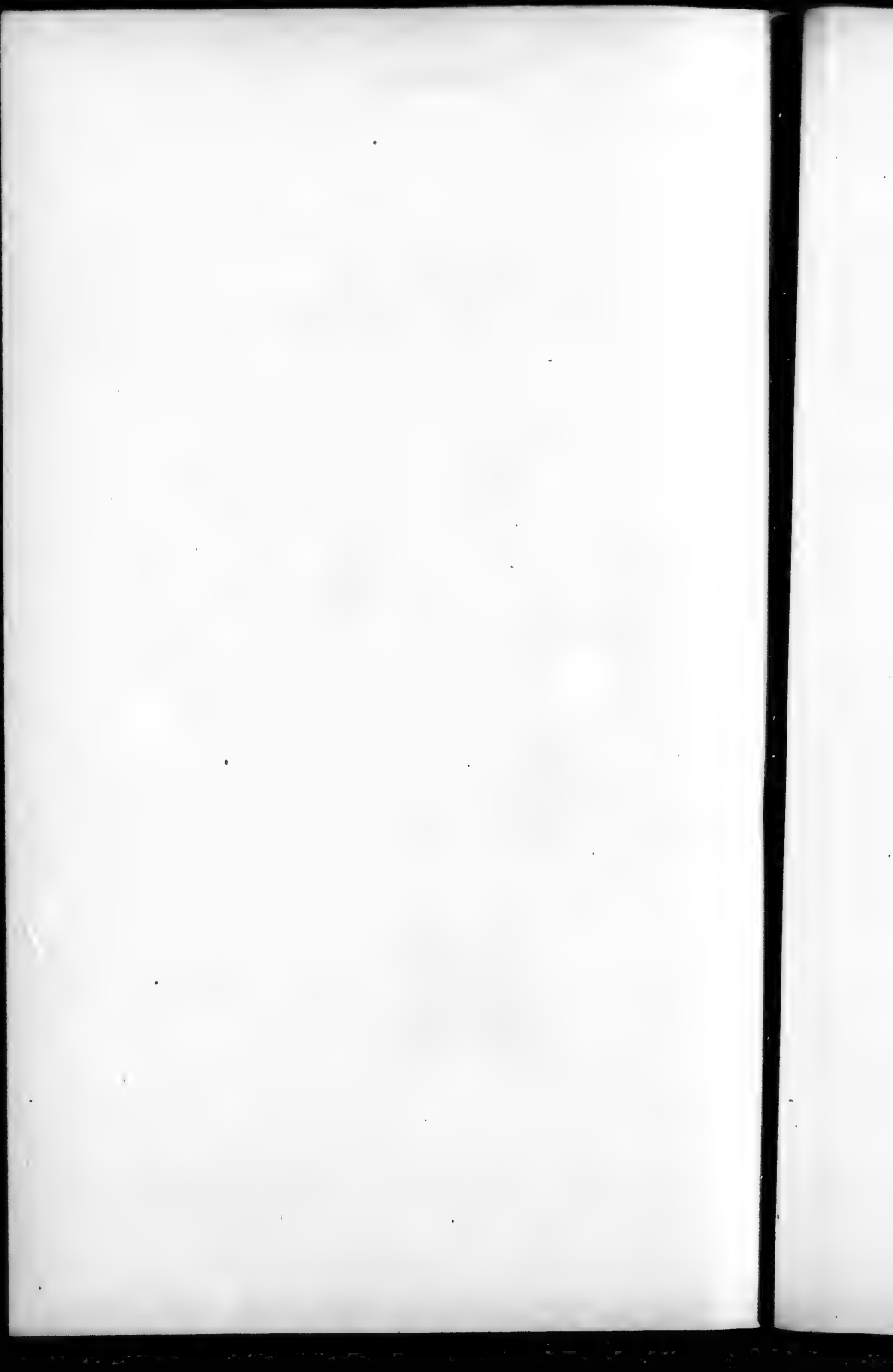


PLATE 19.

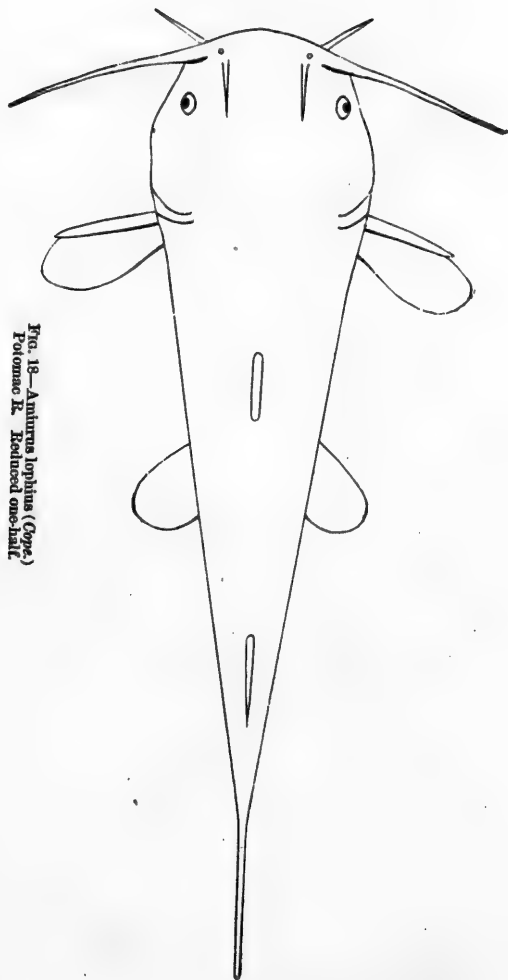


FIG. 18.—*Amurus lophius* (Oguz.)
Totomac R. Reduced one-half.



PLATE 13.

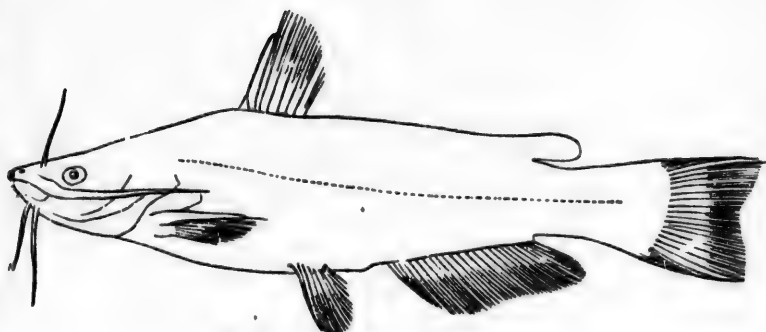


FIG. 19.—*Amiurus erebennus* Jordan.
St. John's I., Fla. From type.

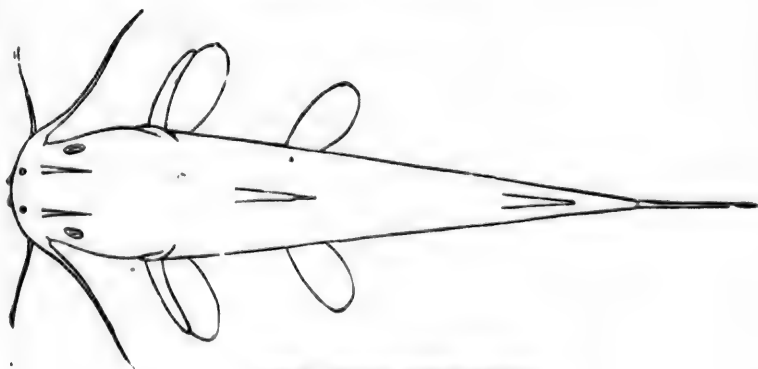


FIG. 20.—*Amiurus erebennus* Jordan.
St. John's I., Fla. From type.

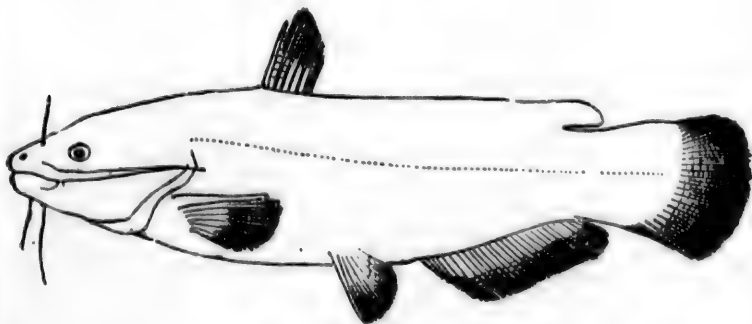


FIG. 21.—*Amiurus natalis* (Le S.) Gill.
(Var. *natalis*)
Lake Erie.

FIG. 23.—*Aspilota nalis* (Raf.) Jac.
Illinois R. Reduced one-half.

PLATE 14.

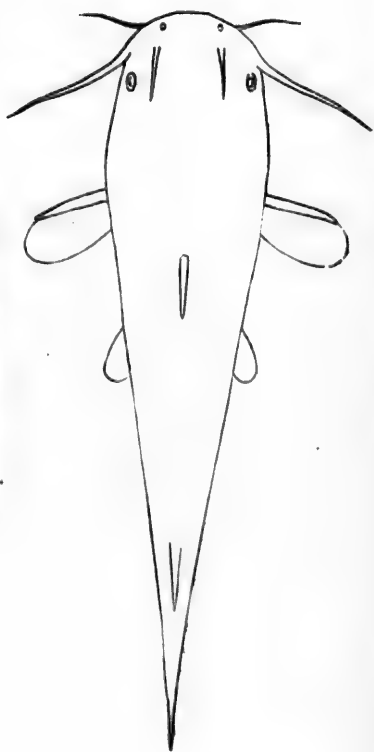


FIG. 22.—*Amiurus natalis* (Lac. S.) GILL.
(Var. *natalis*.)
Lake Erie.



FIG. 23.—*Amiurus natalis lividus* (Raf.) Jor.
Illinois R. Reduced one-half.

FIG. 34 (b).—*Amphura vesalis* Hyatt (Det.) Jan.
Kurean, N. C. Heliconia.



PLATE 15.

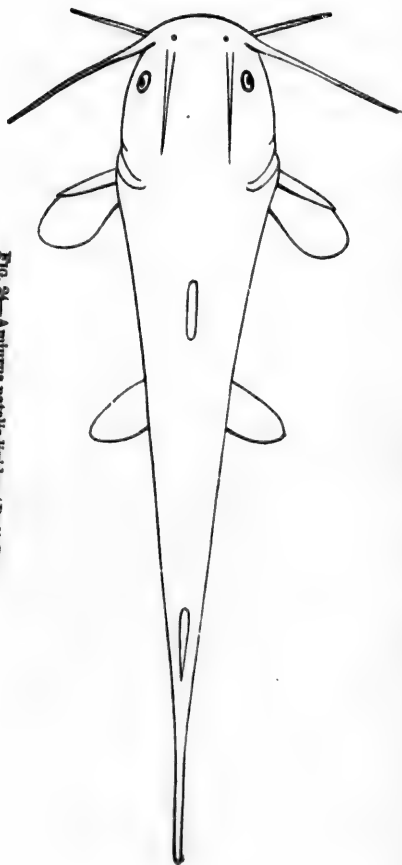


FIG. 34.—*Amlurus natalis lividus* (Raf.) Jac.
Illinois R. Reduced one-half.



FIG. 34 (b).—*Amlurus natalis lividus* (Raf.) Jac.
Kinston, N. C. Reduced.



PLATE 16.

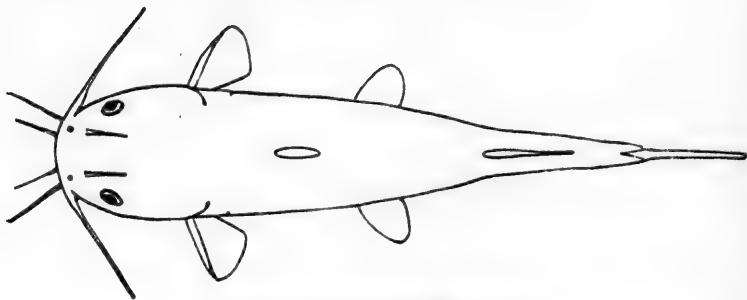


FIG. 24 (c)—*Amiurus natalis lividus* (Raf.) Jor.
Kinston, N. C. Reduced.

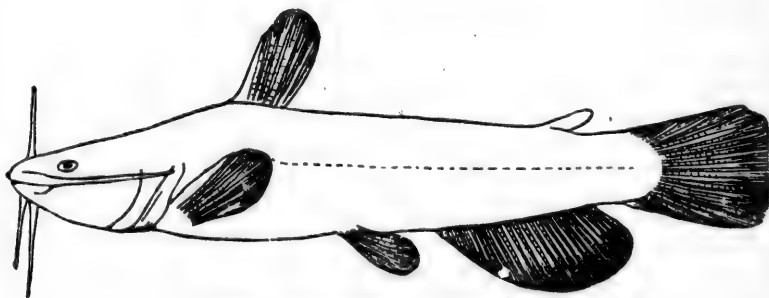


FIG. 25—*Amiurus natalis cenoensis* (Rich.) Jor.
L. Michigan. Reduced one-half.

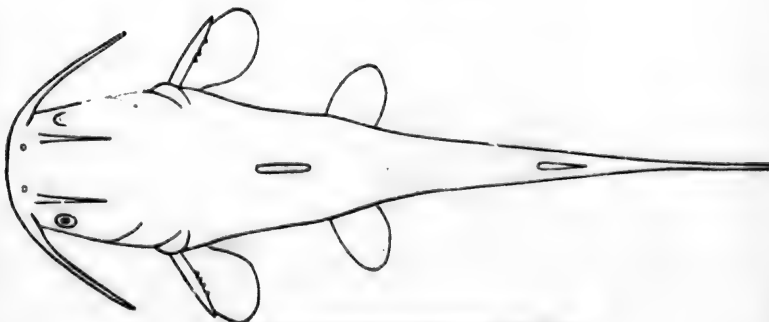


FIG. 26—*Amiurus natalis cenoensis* (Rich.) Jor.
Lake Michigan. Reduced one-half.



De



PLATE 17.

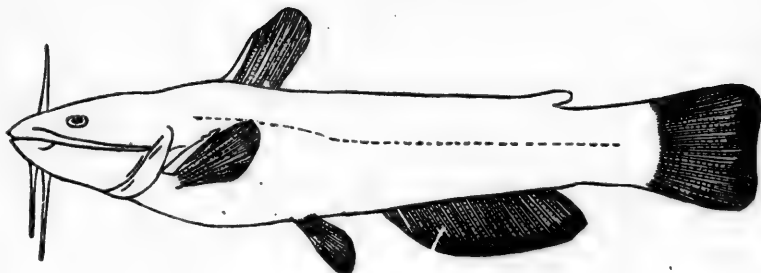


FIG. 27.—*Amiurus natalis cupreus* (Raf.) Jor.
White R., Ind. Reduced one-third.



Dentition lower jaw



Dentition upper jaw.

FIG. 28.—Dentition of *Amiurus natalis cupreus*.

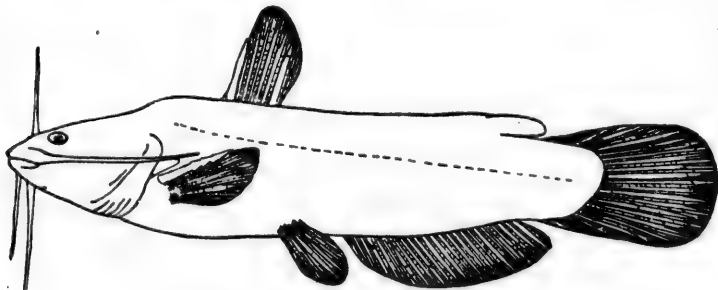


FIG. 29.—*Amiurus natalis antoniensis* (Grd.) Jor.
Etowah R., Ga.

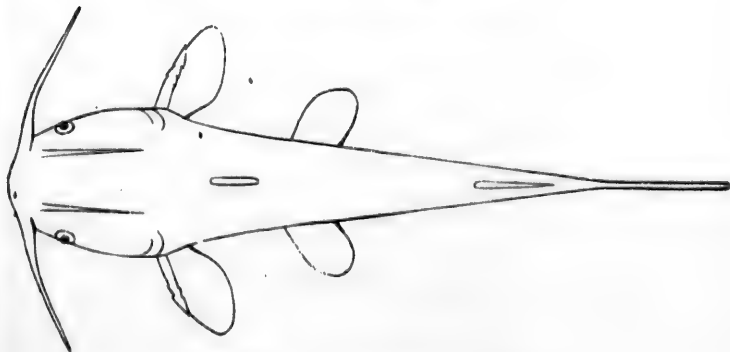


FIG. 30.—*Amiurus natalis antoniensis* (Grd.) Jor.
Etowah River, Georgia.



PLATE 18.



FIG. 31.—*Amiurus natalis analis* (Jordan.)
Little Rock Is., Ark. Nat. size type.
(Dorsal spine abnormal.)

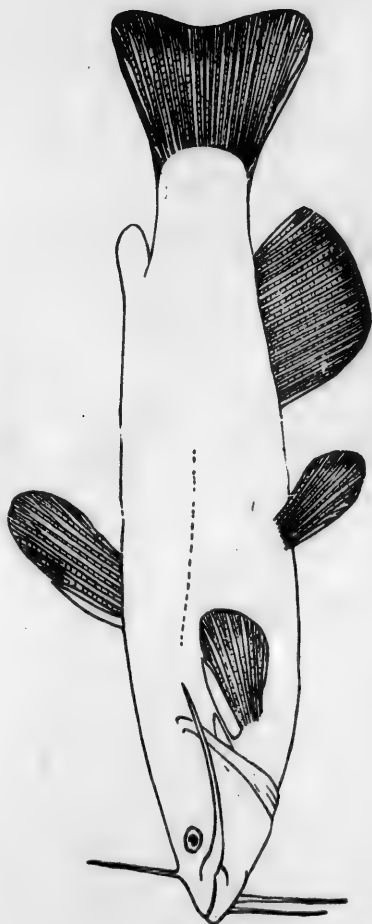


FIG. 32.—*Amiurus vulgaris* (Thompson) Nels.
Lake Michigan. Reduced one-half.



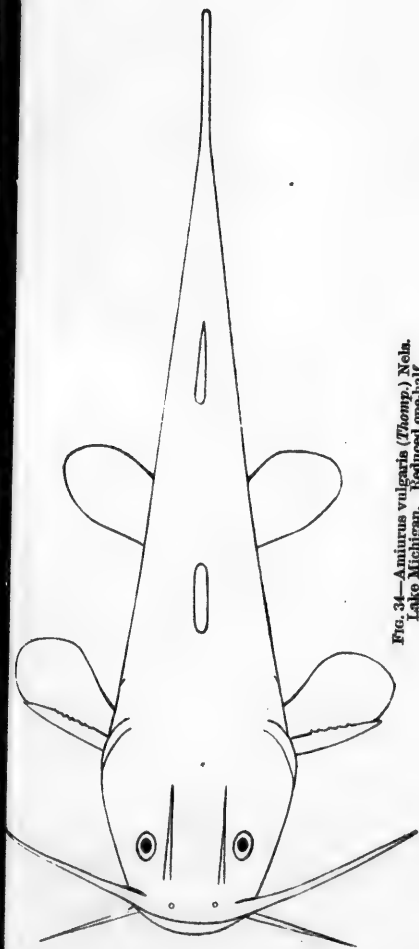


FIG. 34.—*Amiurus vulgaris* (Thomp.) Neha.
Lake Michigan. Reduced one-half.

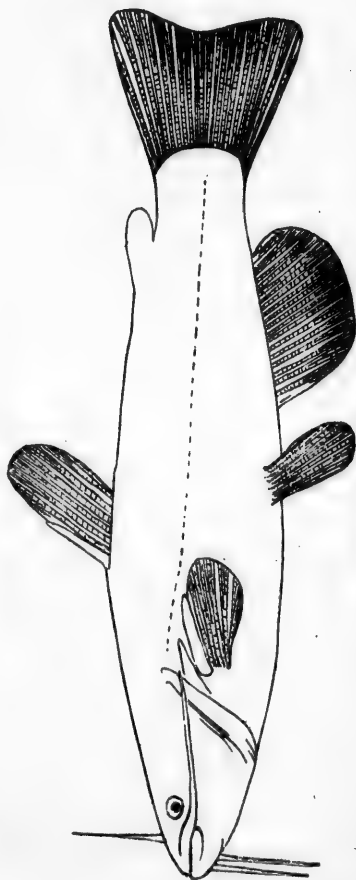


FIG. 35.—*Amiurus vulgaris* (Grd.) Jor.
Illinois R. Reduced one-half.

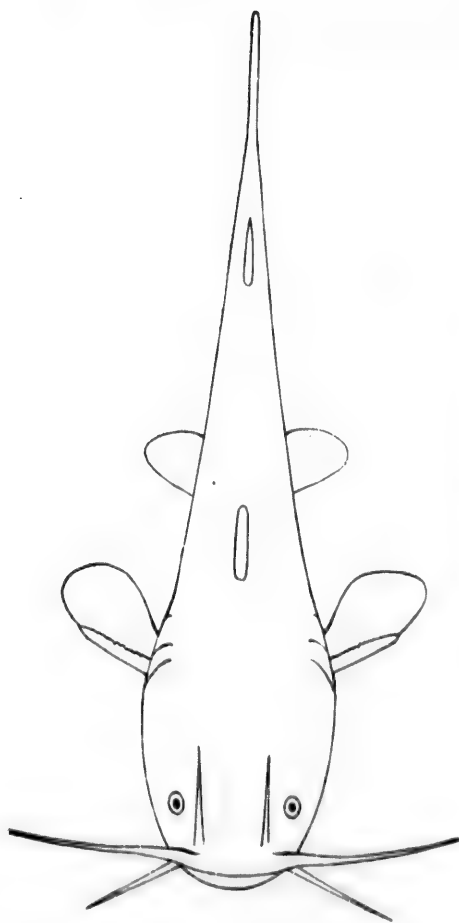


FIG. 35 (b).—*Ambloplites alburnus* (Grd.) Jor.
Mississippi River. Reduced one-half.



PLATE 91.

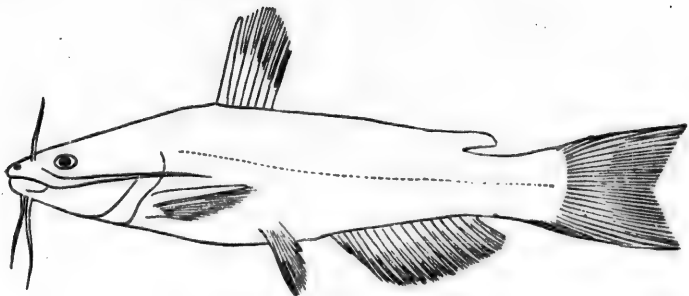


FIG. 36.—*Amiurus marmoratus* (Holbr.) Jor.
Altamaha R.

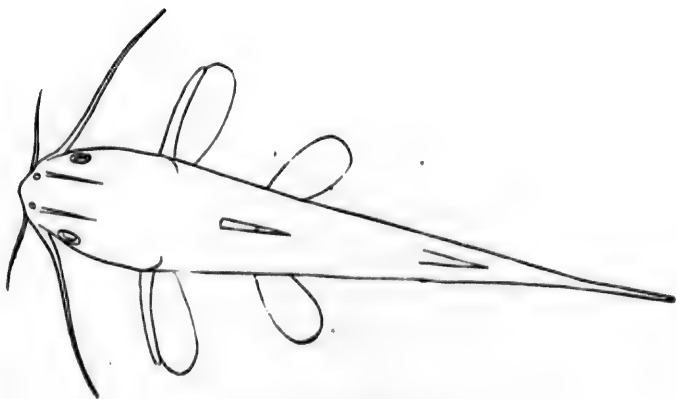


FIG. 37.—*Amiurus marmoratus* (Holbr.) Jor.
Altamaha R.

PLATE 22.

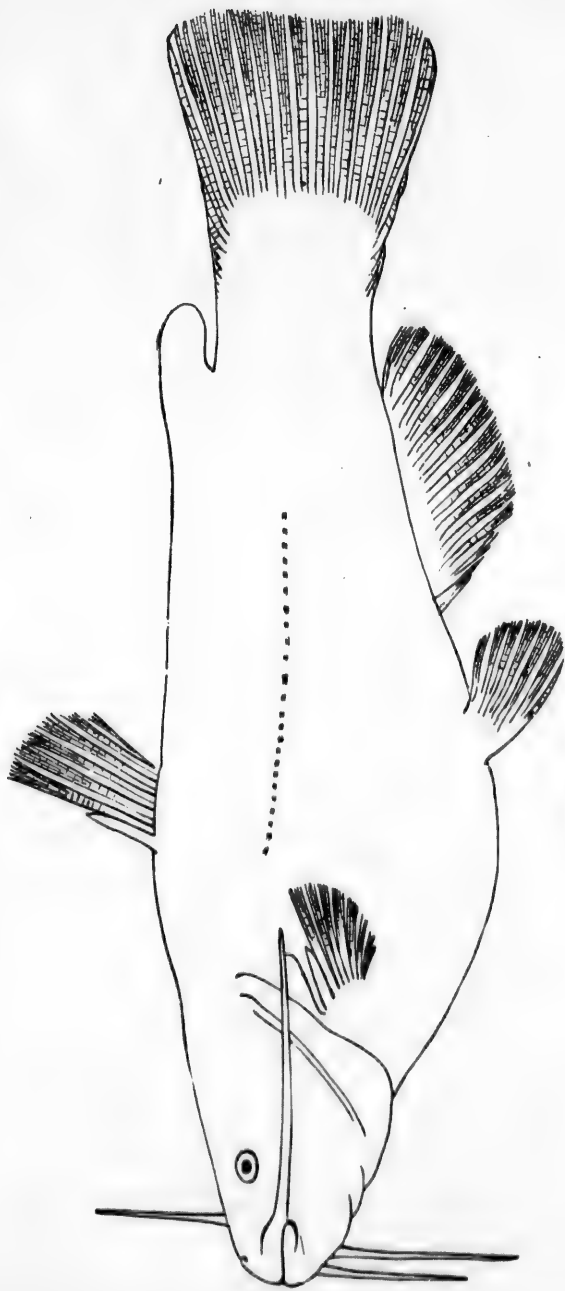


FIG. 22.—*Amiurus melas* (Raf.). Jordan & Cooperland.
Illinois R. Reduced one-half.

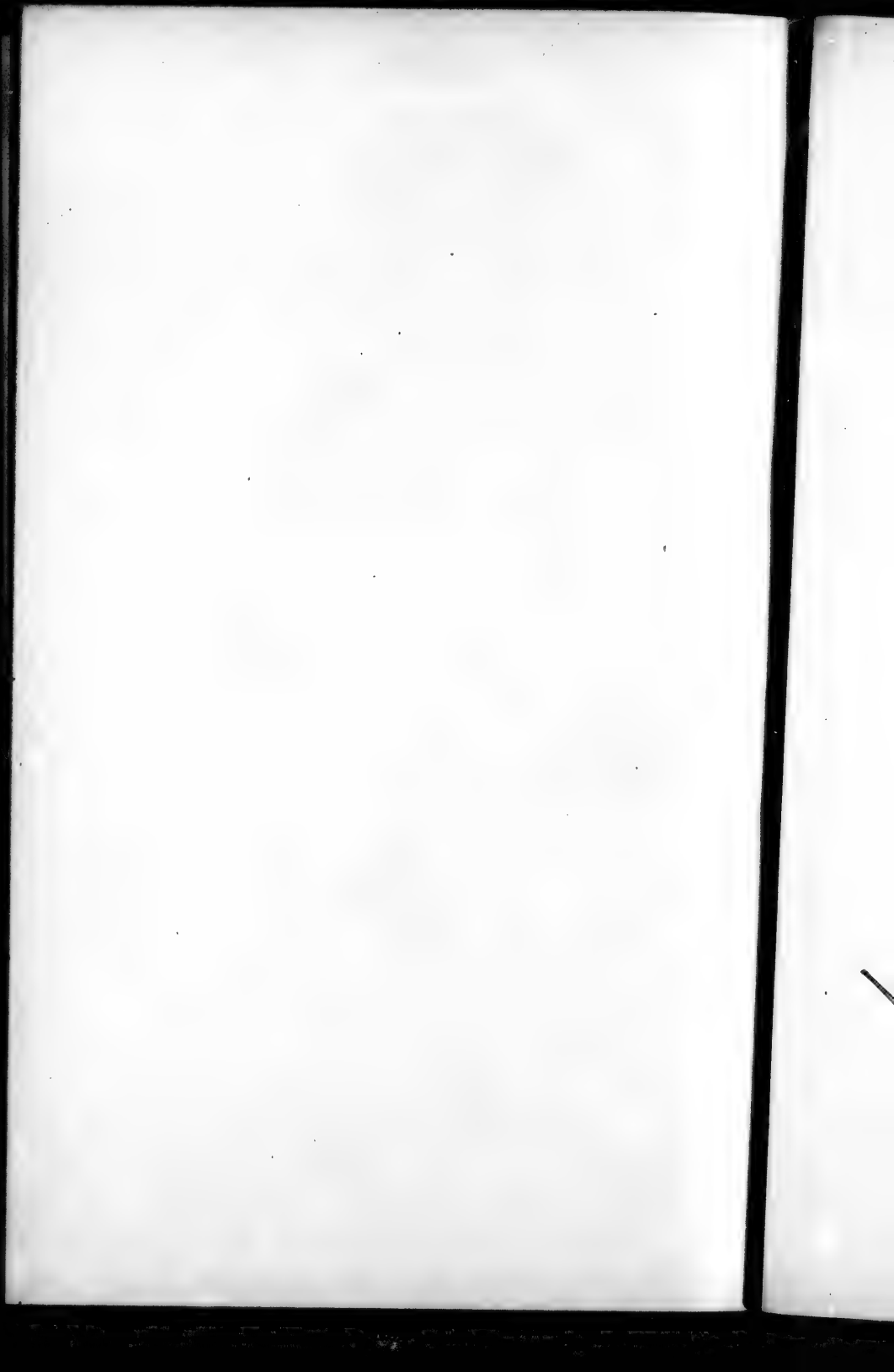


PLATE 93.

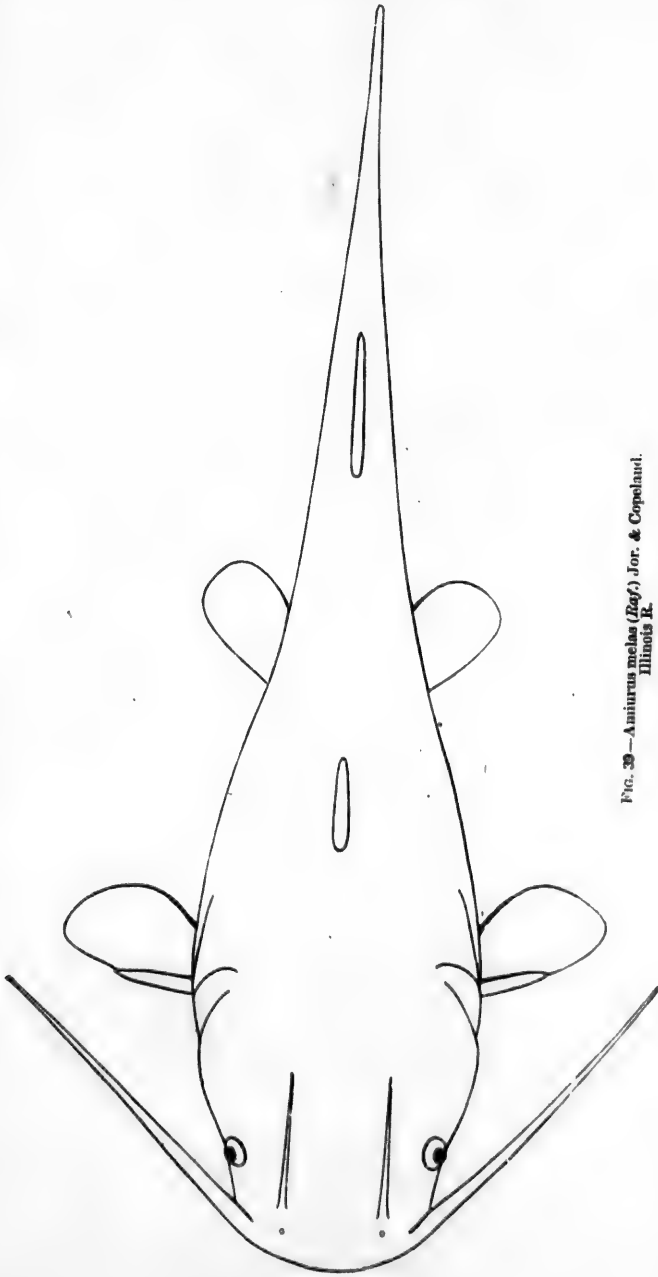


FIG. 39.—*Amiurus melas* (Baf.) Jor. & Copeland.
Illinois R.



PLATE 24.

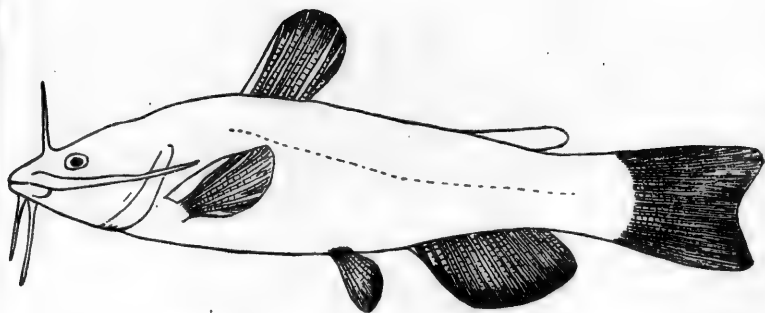


FIG. 39 (b)—*Amiurus melas* (Raf.) Jor. & Copeland.
Illinois R.

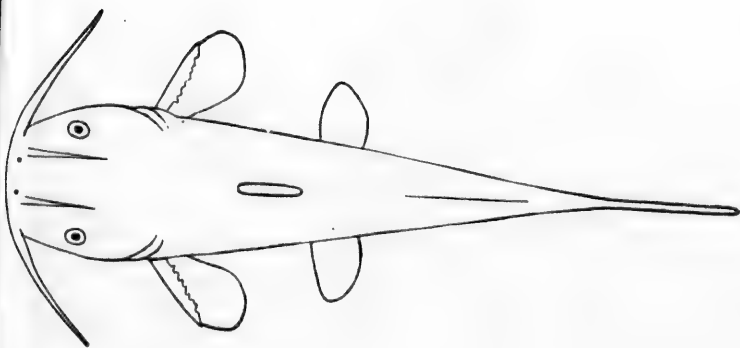


FIG. 39 (c)—*Amiurus melas* (Raf.) Jor. & Copeland.
Illinois R. Reduced one-half.

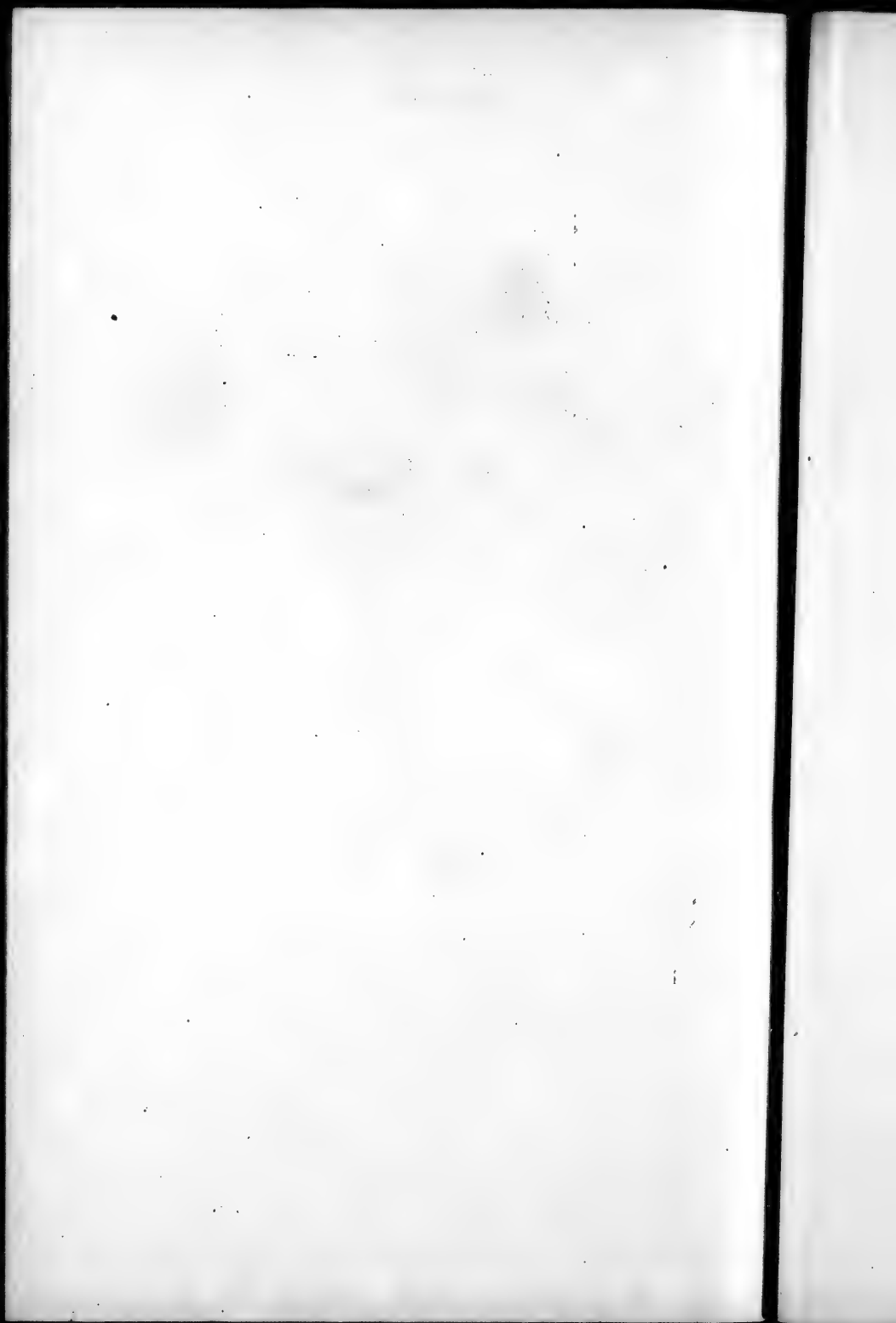


PLATE 95.

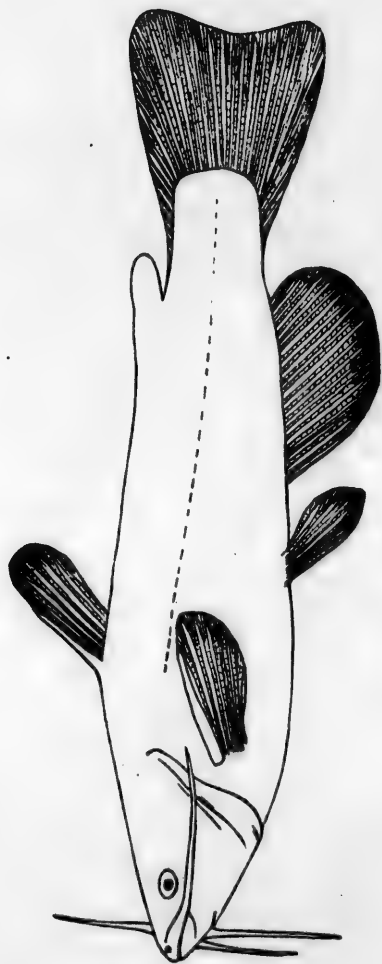
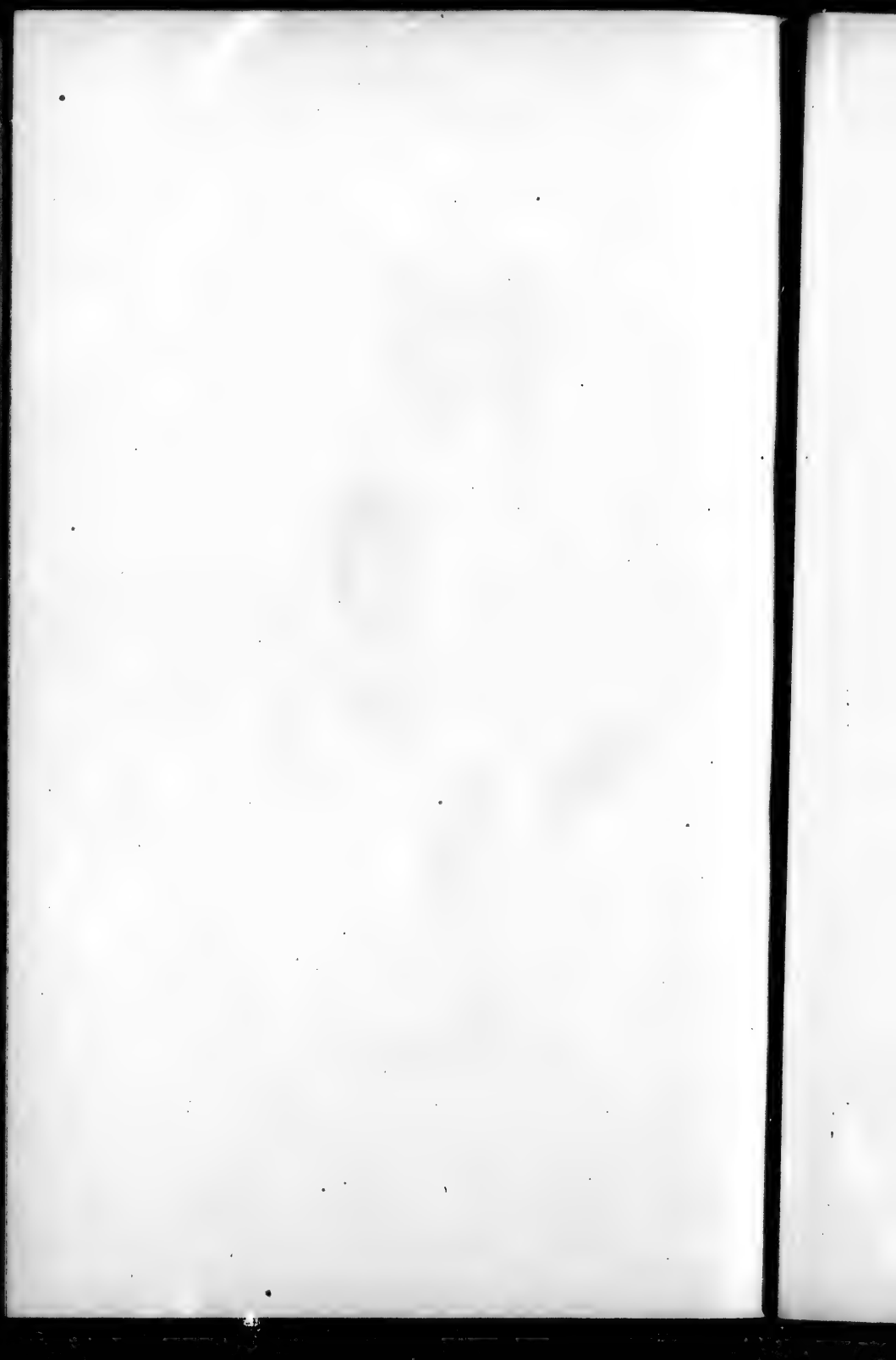


FIG. 40.—*Ambloplites catus* (L.) Gill.
Delaware R.



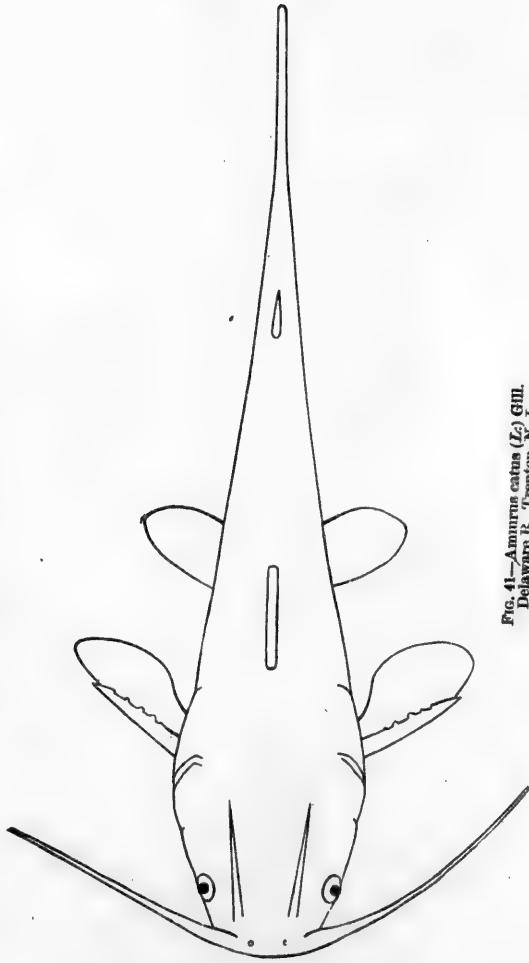


FIG. 41.—*Amurus catus* (L.) Gml.
Delaware R., Trenton, N. J.

PLATE 27.

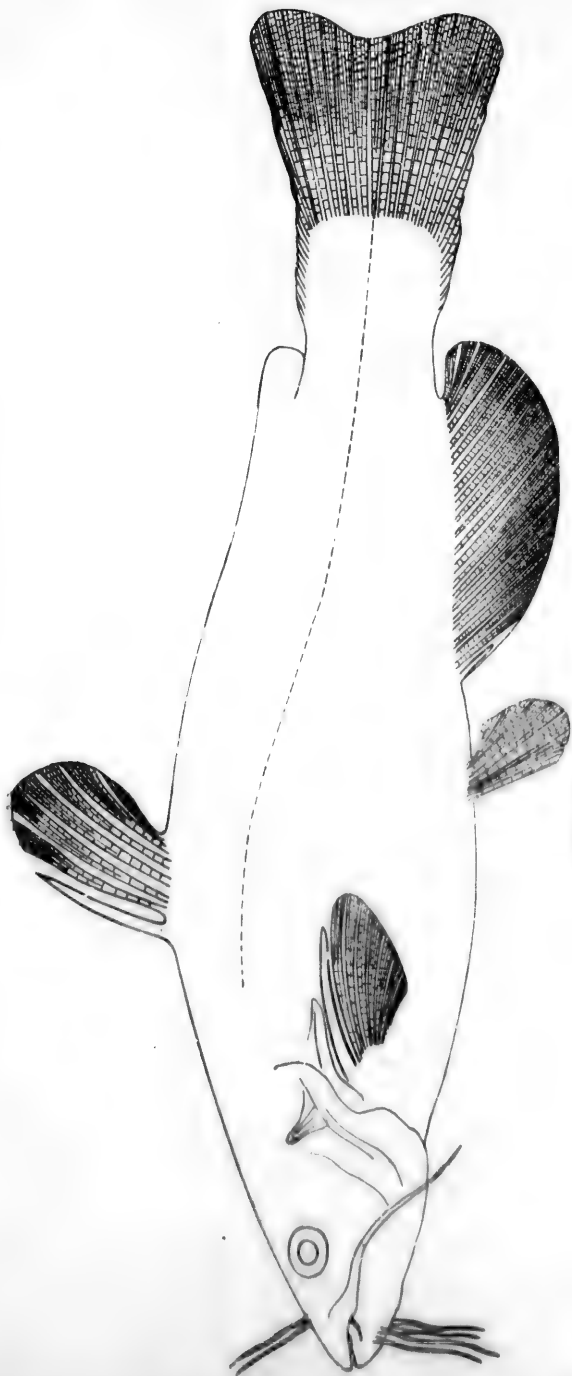


FIG. 41 (b).—*Etheostium whipplei* (Cope).
Mississippi Creek, Delaware. Max. size from types.



PLATE 99.



FIG. 41 (c).—*Alopias micropinna* (Opa.)
Mispillion Creek, Delaware. Not. size from type.



PLATE 99.

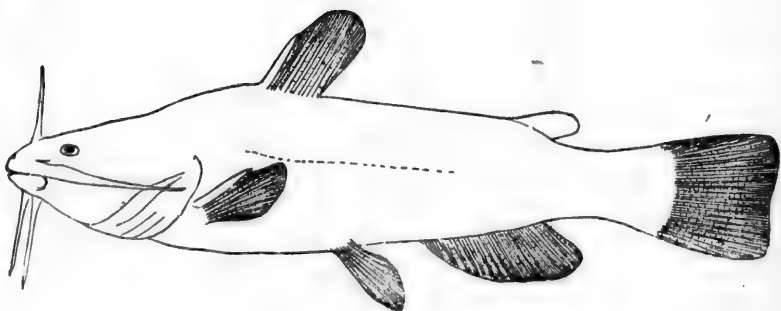


FIG. 42.—*Amiurus xanthocephalus* (Raf.) Gill.
White R., Ind. Reduced one-half.

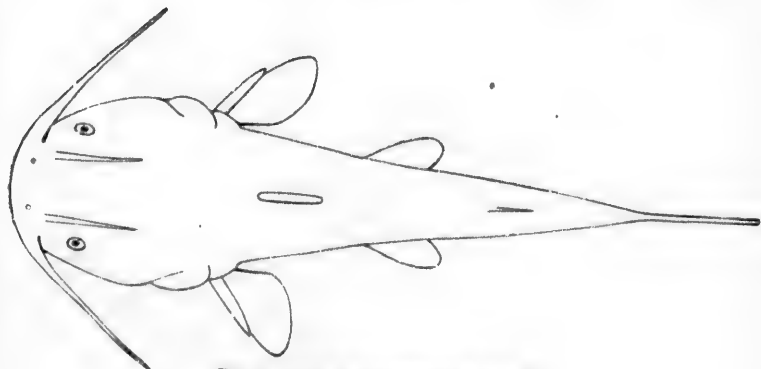


FIG. 43.—*Amiurus xanthocephalus* (Raf.) Gill.
White R., Ind. Reduced one-half.

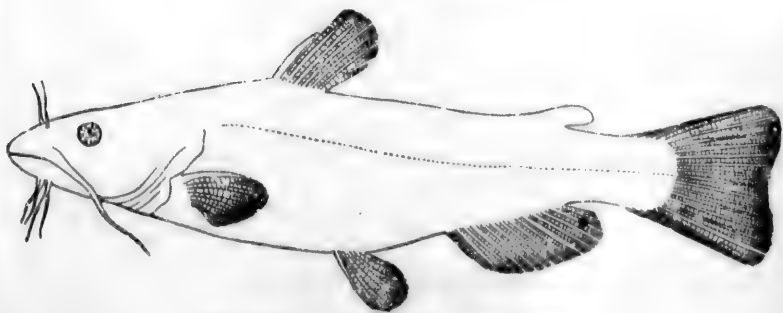


FIG. 44.—*Amiurus nigrilabris* (Cope) Gill & Jordan.
Conestoga Creek, Pa. (From type)



PLATE 30.

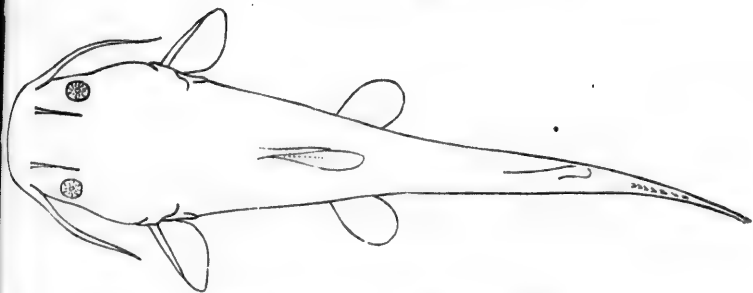


FIG. 45—*Amlurus nigrilabris* (Cope) Gill & Jordan.
Conestoga Creek, Pa. (From type.)

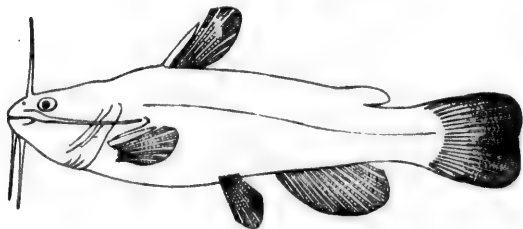


FIG. 46—*Amiurus pulvis* (Dekay) Gill.
Genesee R., N. Y. Nat. size.

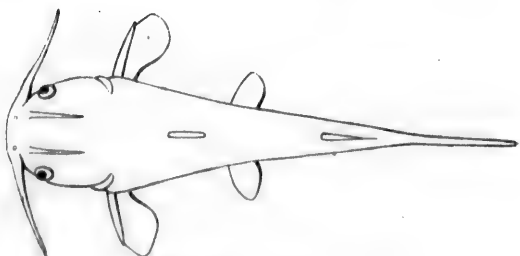


FIG. 47—*Amiurus pullus* (Dekay) Gill.
Genesee R.

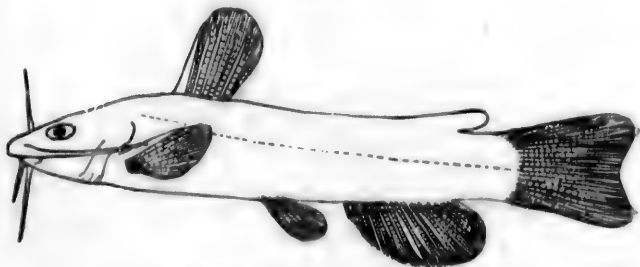


FIG. 48—*Amiurus brunneus* (For.)
Ocmulgee R., Ga. (Type.)



PLATE 31.

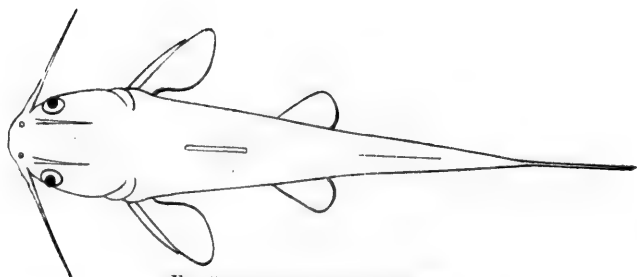


FIG. 49.—*Amlurus brunneus* (Jordan.)
Ocmulgee R., Ga. From types.

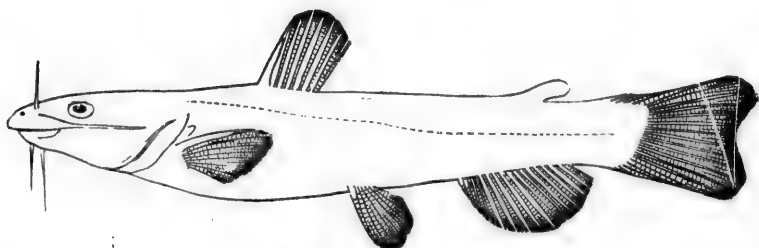


FIG. 49 (b)—*Amlurus brunneus*, Jordan.
(Adult.) Saluda River, S. C. Reduced one-half.

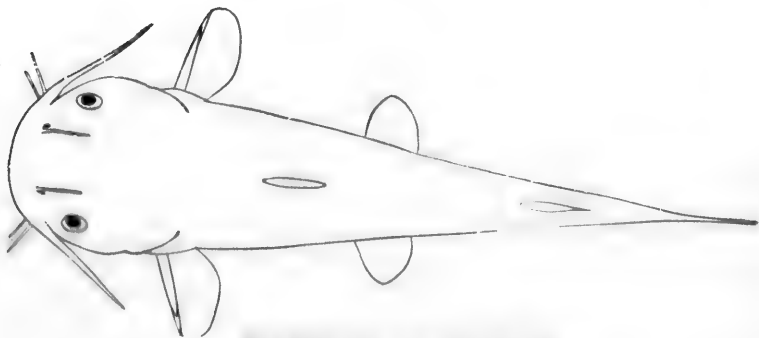


FIG. 49 (c)—*Amlurus brunneus*, Jordan.
(Adult.) Saluda River, S. C. Reduced one-half.

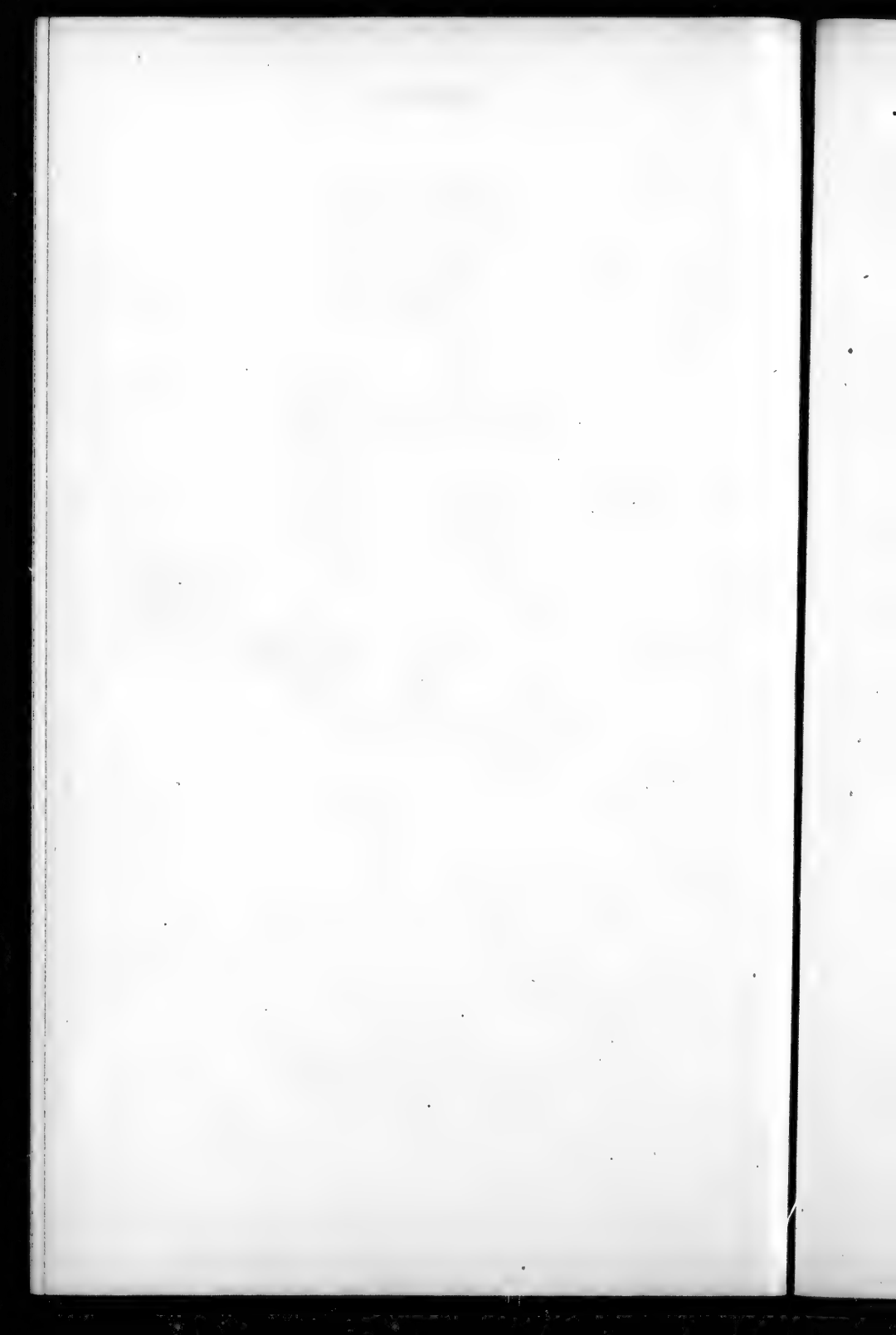


PLATE 32.

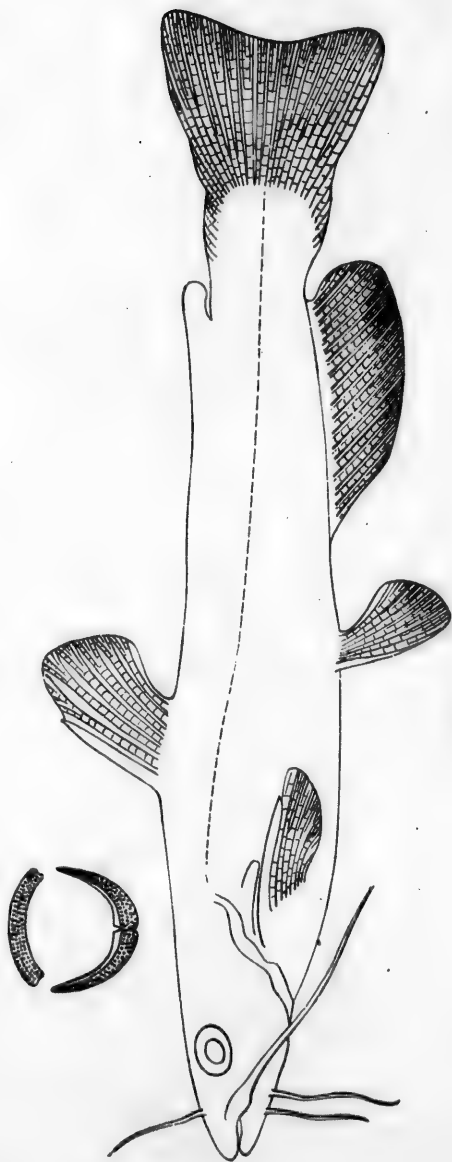
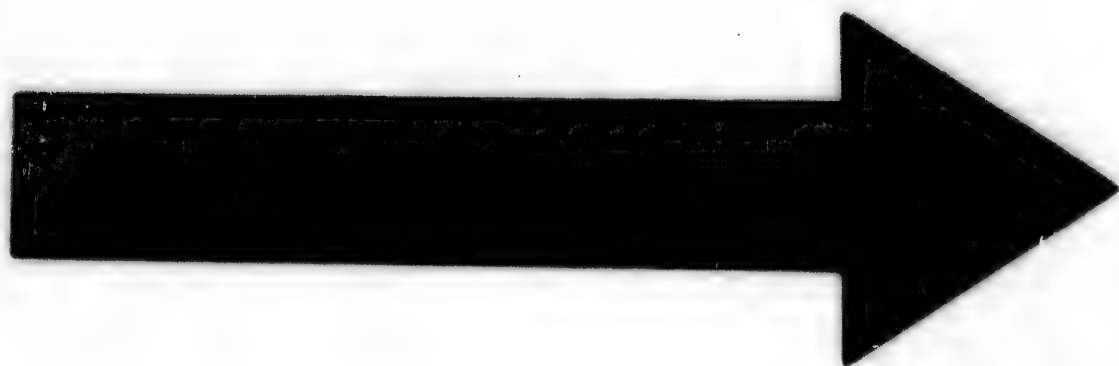


FIG. 50.—*Amiurus platycephalus* (Gill.) Gill.
North Carolina.



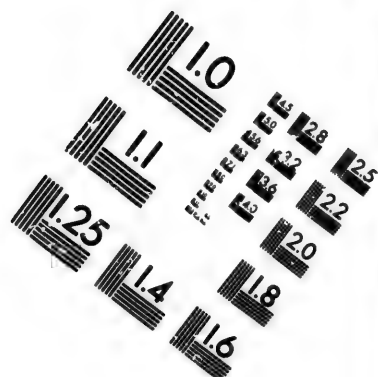
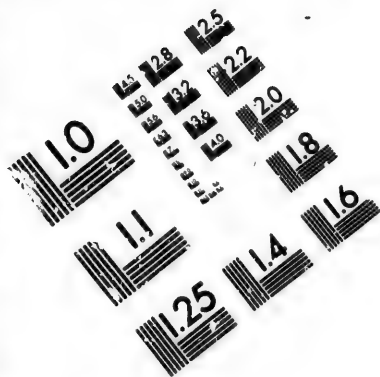
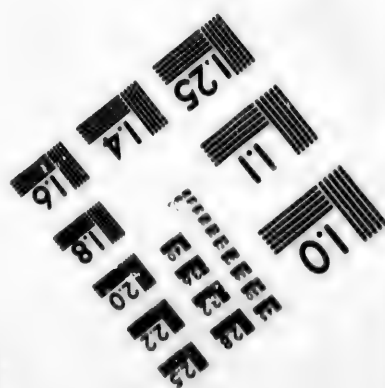
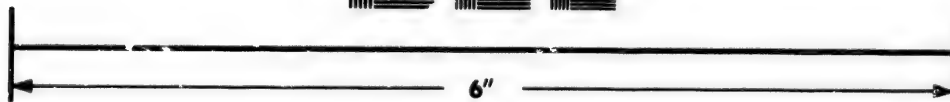
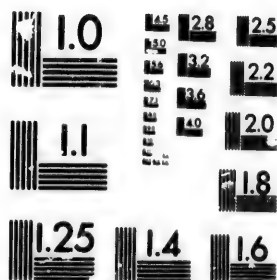


IMAGE EVALUATION TEST TARGET (MT-3)



Photographic Sciences Corporation

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WEBSTER, N. Y. 14580
(716) 572-4503

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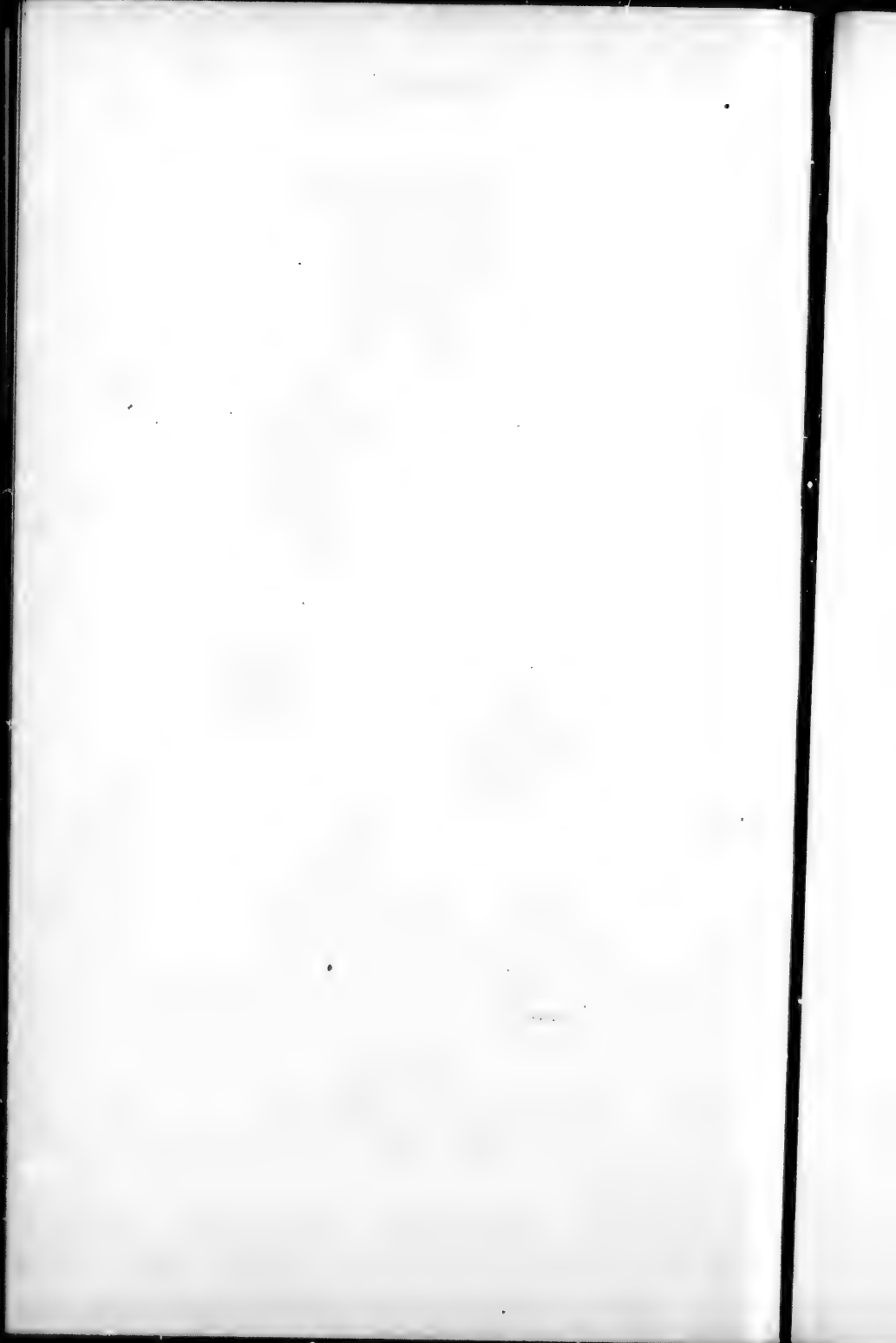


PLATE 33.

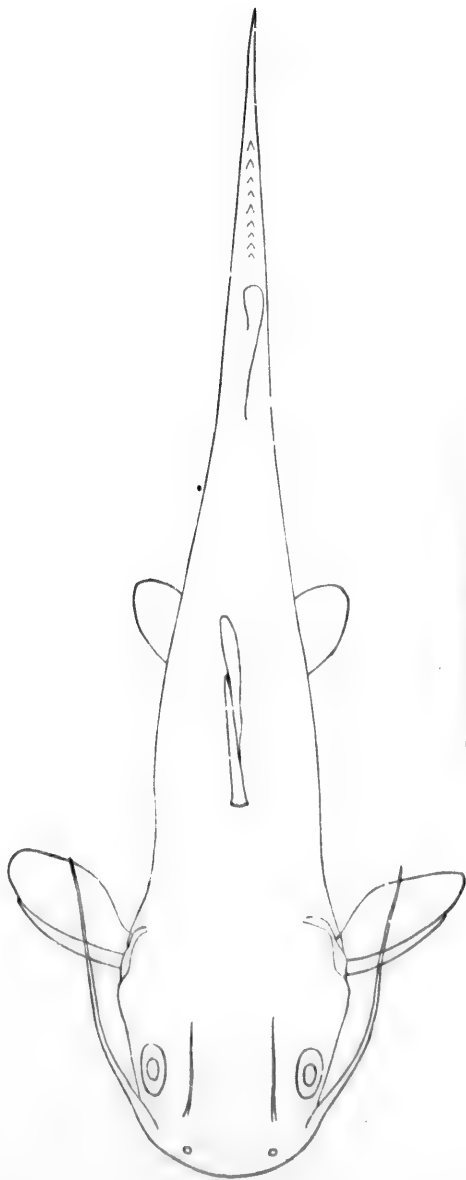


FIG. 51.—*Amirus platycephalus* (Ord.) Gill.
North Carolina.

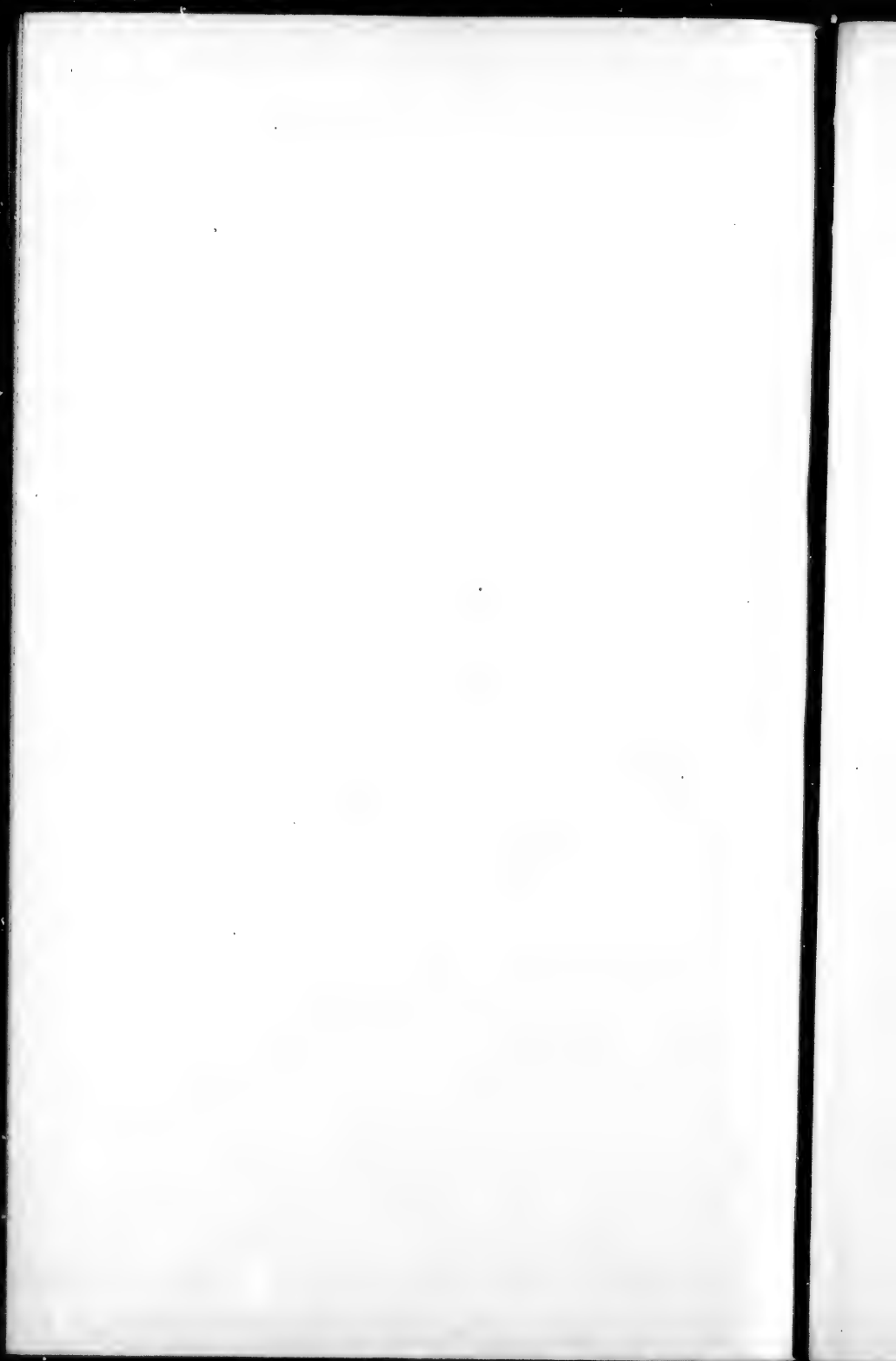


PLATE 34.

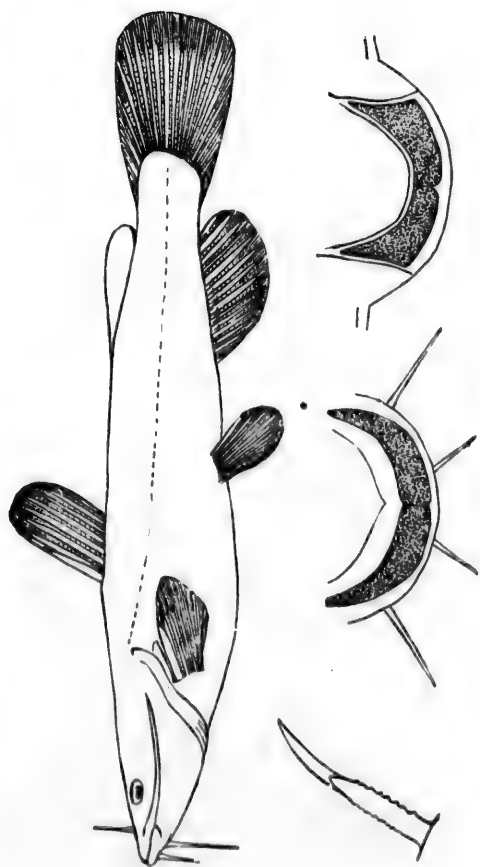


FIG. 52.—*Polodichthys olivaris* (Eaf.) G. & J.
French Broad R. Reduced one-half.

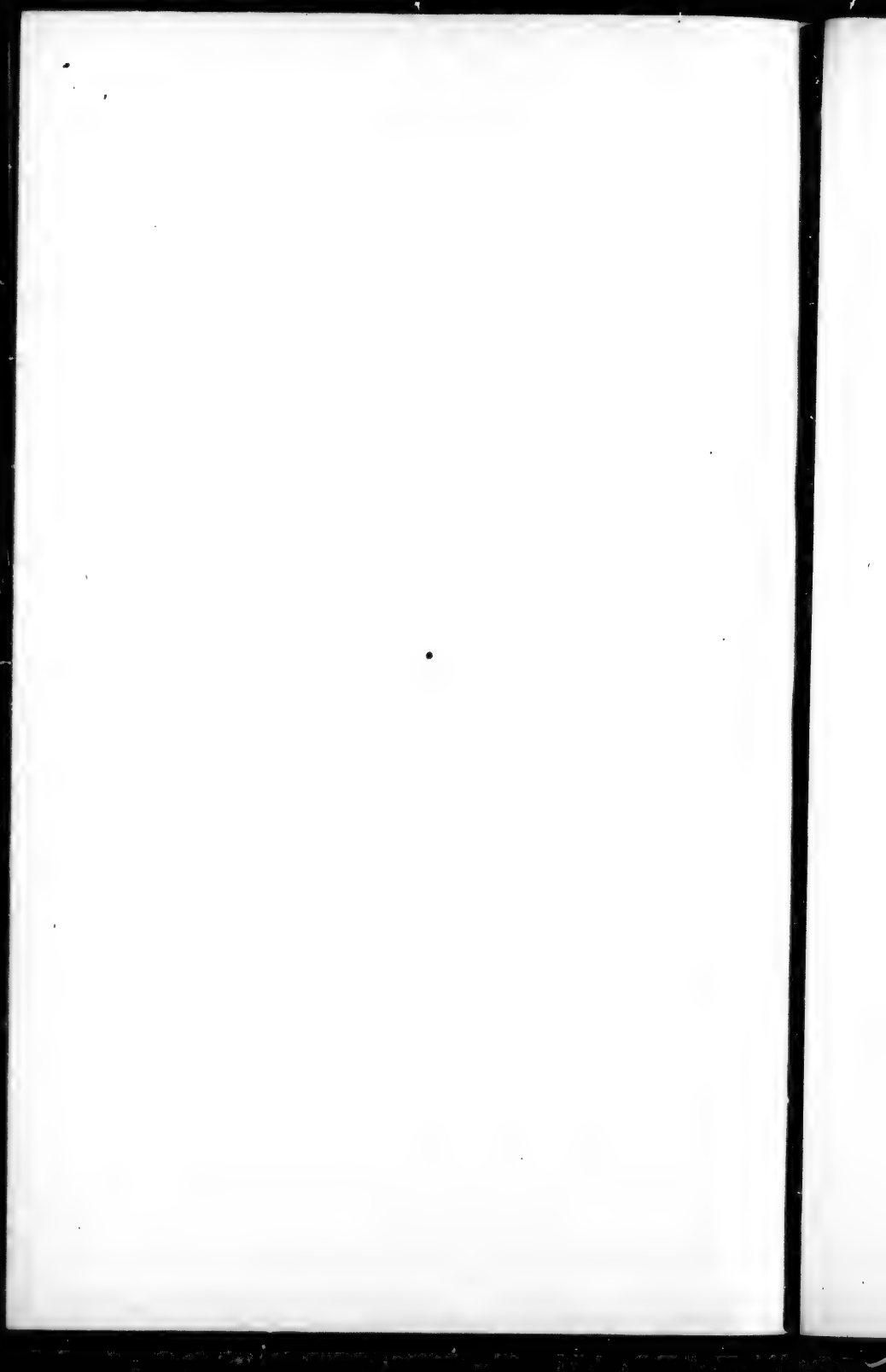


PLATE 35.

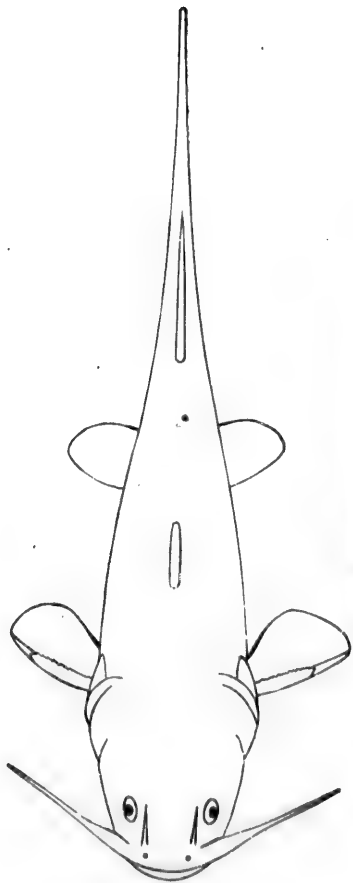


FIG. 53.—*Pelodictichus olivaris* (Reg.) Gill & Jer.
French Broad R. Reduced one-half.

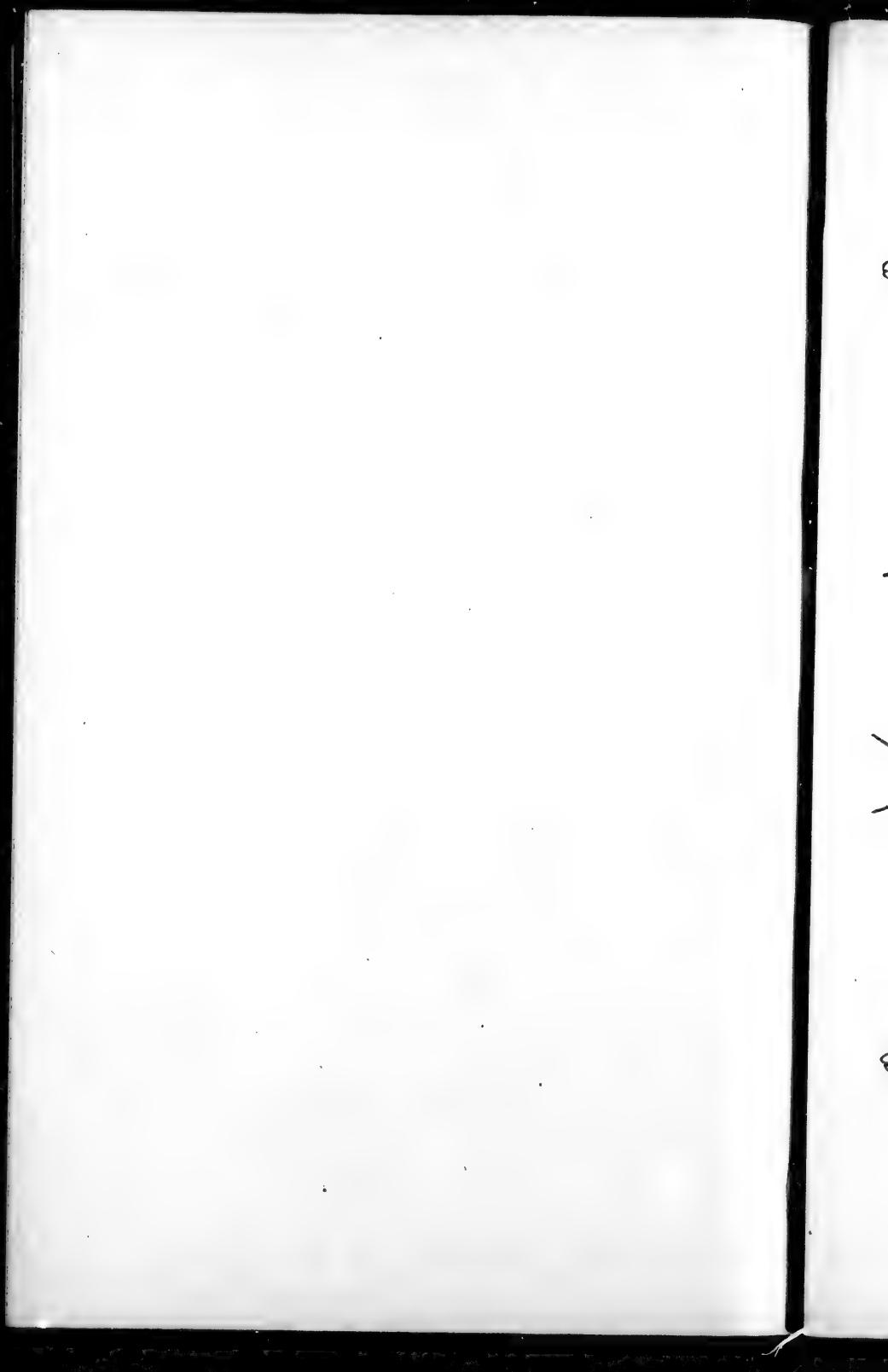
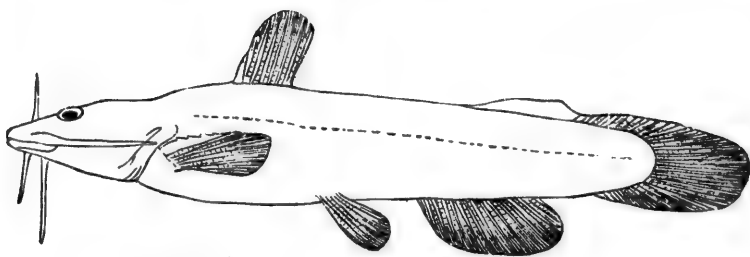


PLATE 36.



Pectoral spine, 2 diams.



Dentition both jaws.



Dentition upper jaw.

FIG. 54.—*Noturus flavus* Raf.
Ohio R., W. Va. Reduced one-sixth.

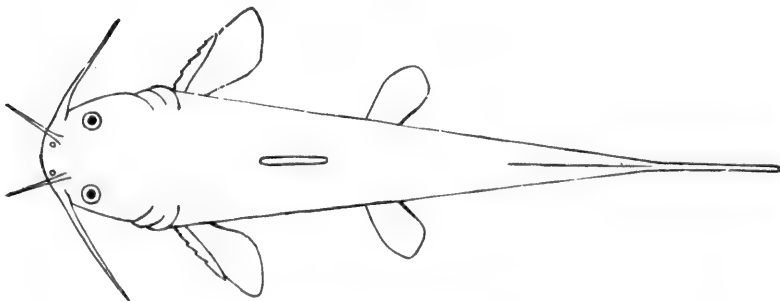


FIG. 53.—*Noturus flavus* Raf.
Ohio R., W. Va. Reduced one-sixth.

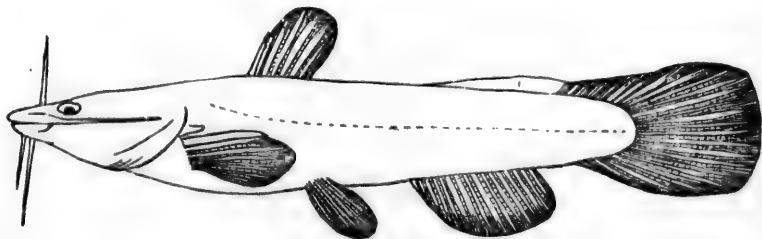


FIG. 56.—*Noturus insignis* (Rich) G. & J.
Penna.

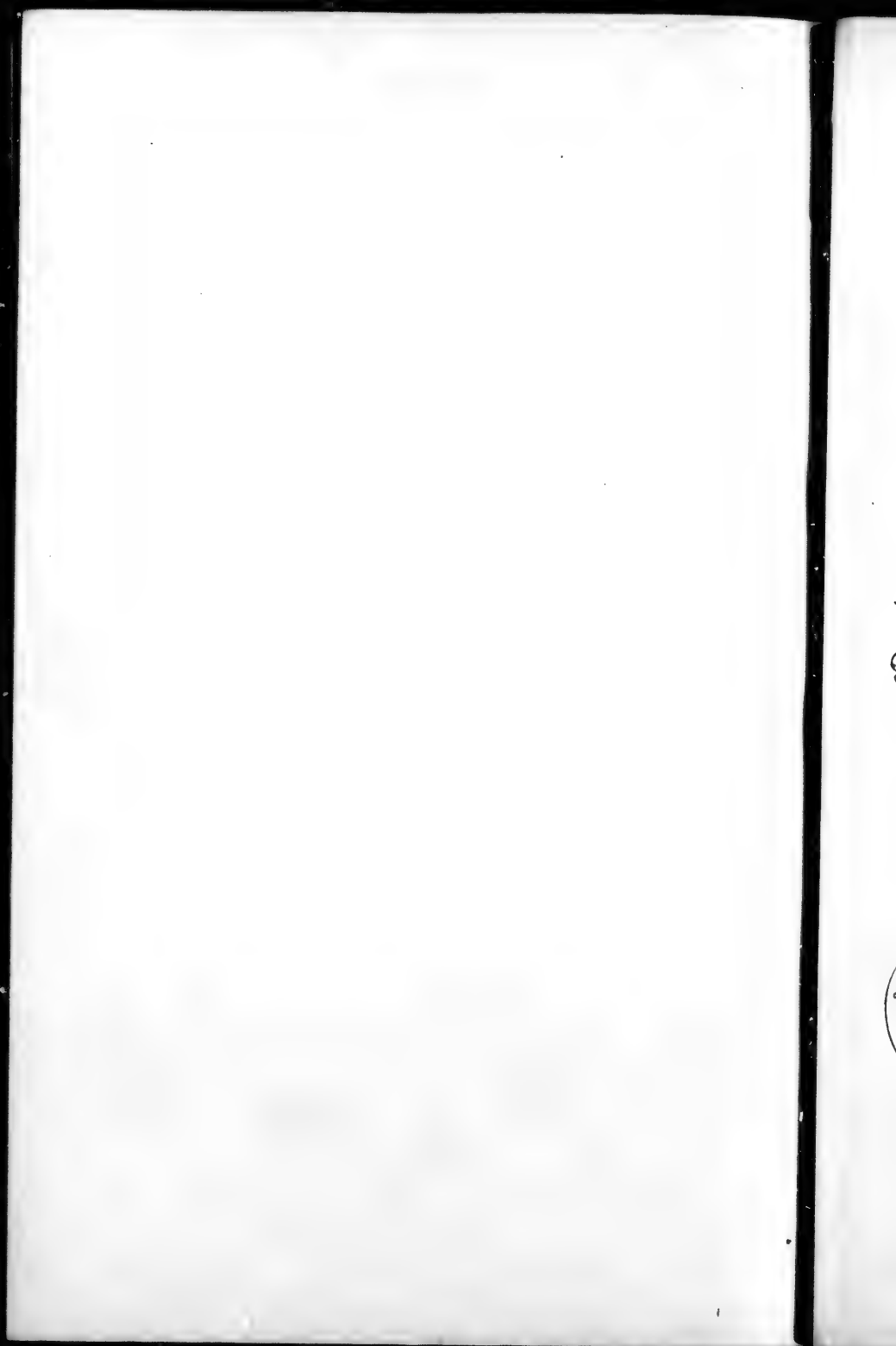


PLATE 37.

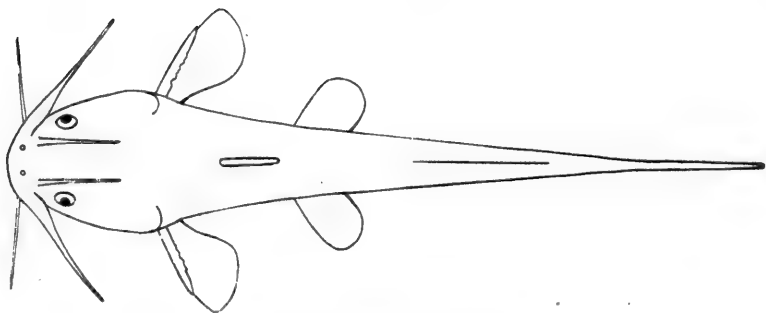


FIG. 57.—*Noturus insignis* (Rich.) G. & J.
Penn.

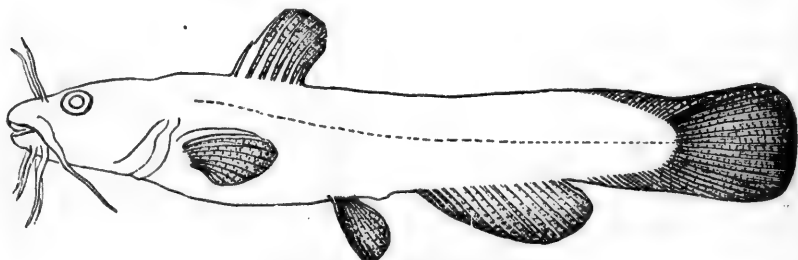


FIG. 57 (b).—*Noturus insignis* (Rich.) G. & J.
Penn.

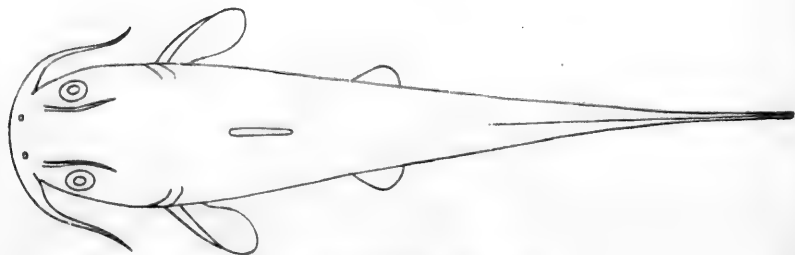


FIG. 57 (c).—*Noturus insignis* (Rich.) G. & J.
Penn.

11

PLATE 38.

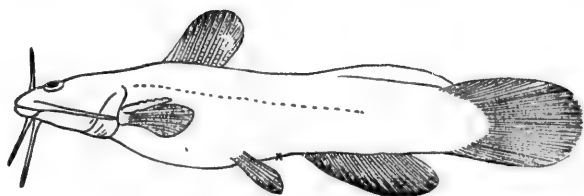


FIG. 58.—*Noturus exilis* Nelson.
Root R., Wis. Nat. size.

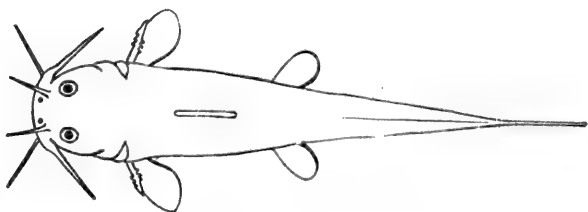


FIG. 59.—*Noturus exilis* Nelson.
Root R., Wis. Nat. size.

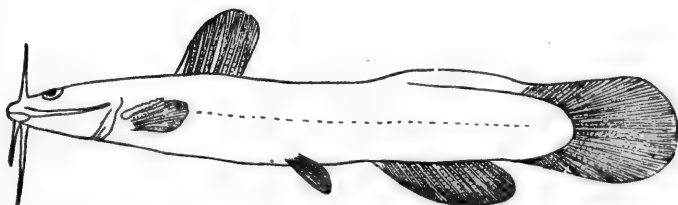


FIG. 50 (b).—*Noturus exilis* Nelson.
Illinois R. From one of three original types.

PLATE 39.

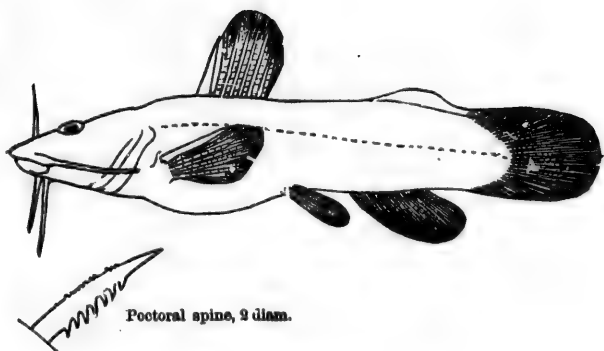


FIG. 60.—*Noturus miurus* Jordan.
White R., Ind. Nat. size.

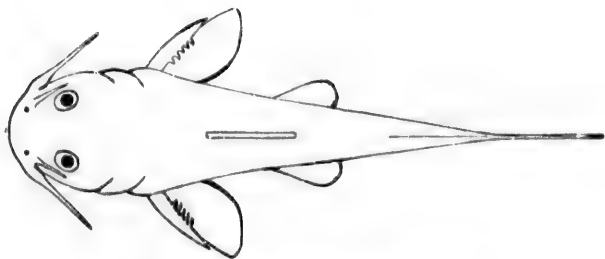


FIG. 61.—*Noturus miurus* Jordan.
White R., Ind. Nat. size from type.

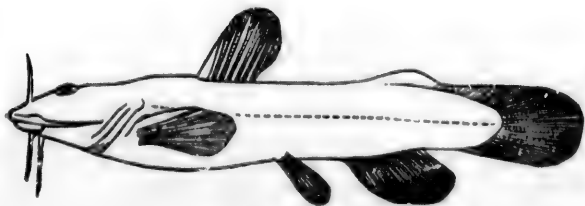
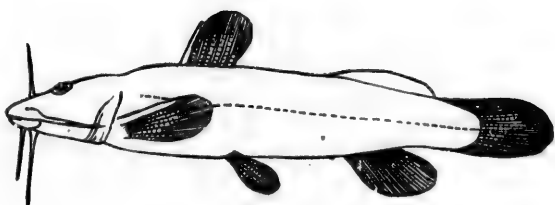


FIG. 61 (b).—*Noturus miurus* Jordan.
Ohio R., W. Va. Nat. size.



PLATE 40.



Pectoral spine, enlarged 9 diams.

FIG. 62.—*Noturus eleutherus* Jordan.
French Broad R. Type nat. size.

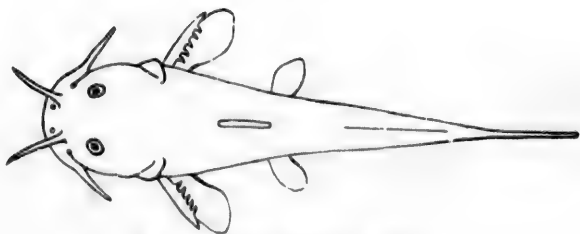


FIG. 63.—*Noturus eleutherus* Jordan.
French Broad R. Type nat. size.

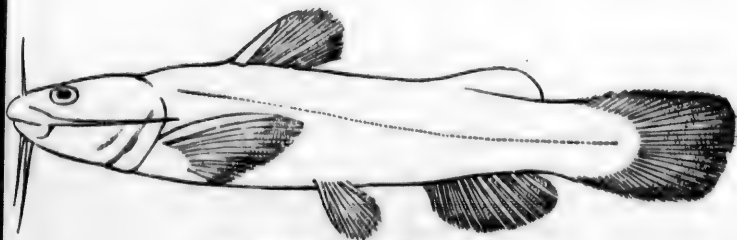


FIG. 63 (b).—*Noturus eleutherus* Jordan.
Tar River, N. C.

W

PLATE 41.

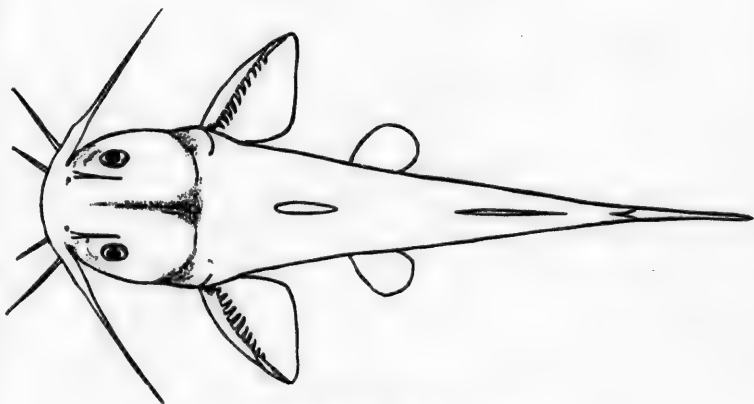


FIG. 63 (c)—*Noturus eleutherus* Jordan.
Tar River, N. C.



Pectoral spine, 2 diams.

FIG. 64—*Noturus leptacanthus* Jordan.
Etowah R., Ga. Type spec. Nat. size.

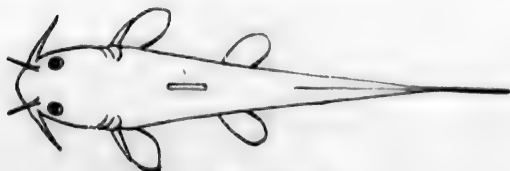


FIG. 65—*Noturus leptacanthus* Jordan.
Etowah R., Ga. Nat. size, type.

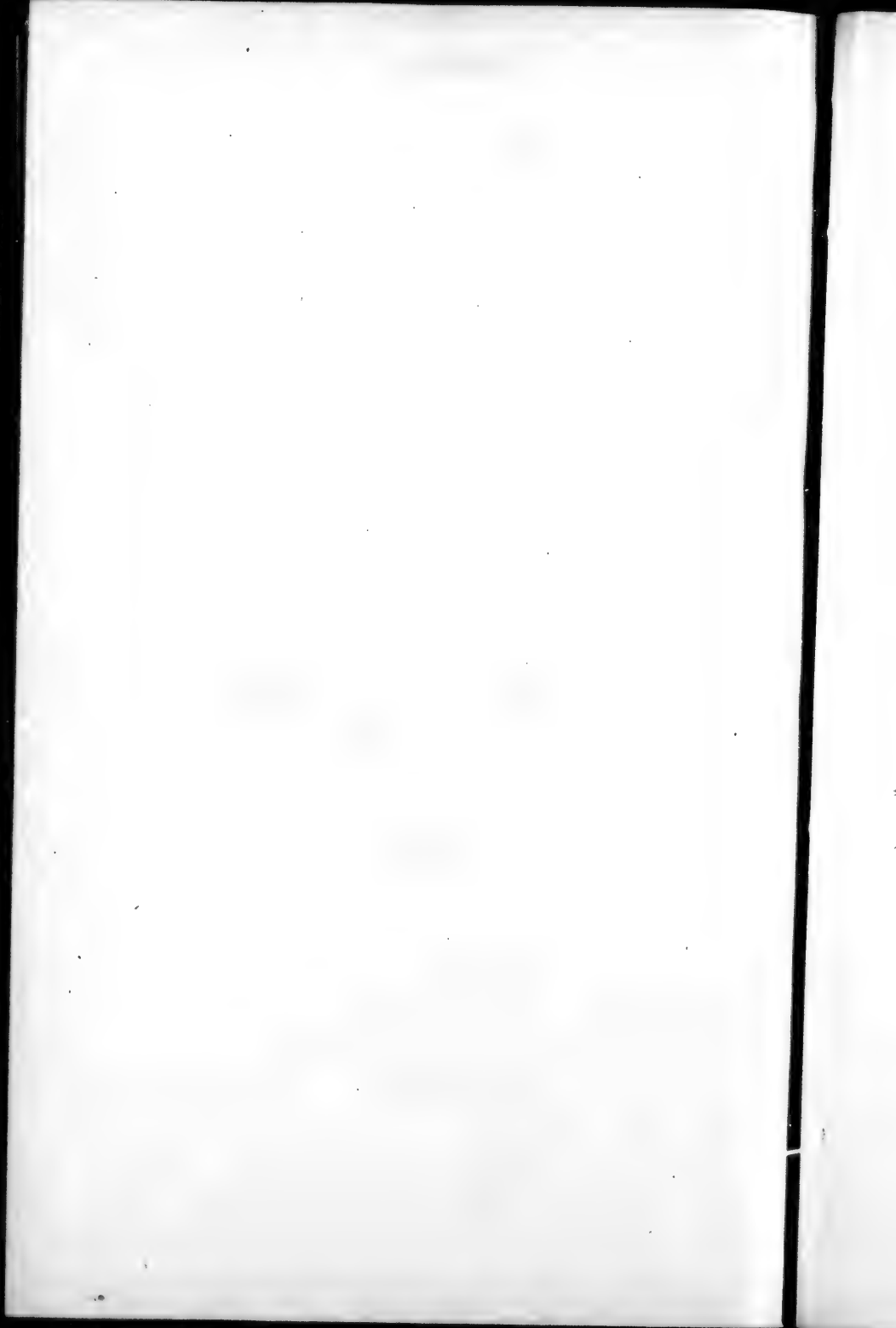


PLATE 49.

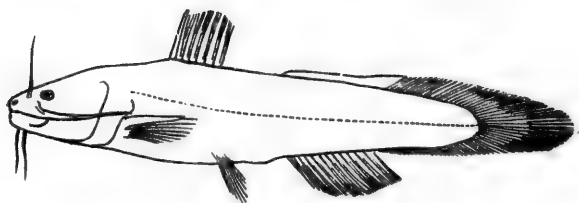


FIG. 66—*Noturus gyrinus* (Mitch.) Raf.
Hudson R. Nat. size.

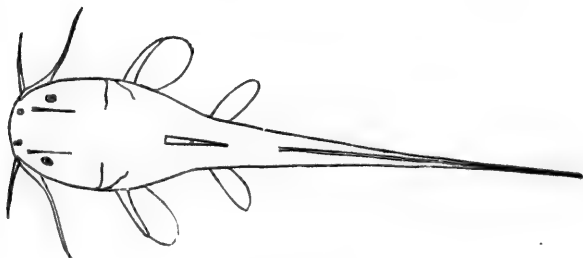
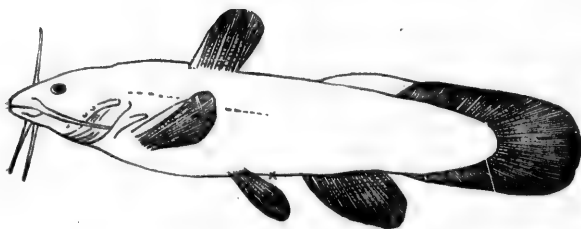


FIG. 67—*Noturus gyrinus* (Mitch.) Raf.
Hudson R.



Dentition of lower jaw.



Dentition of upper jaw.



FIG. 68—*Noturus stalis* Jordan.
White R., Ind. Nat. size.



Pectoral spine.

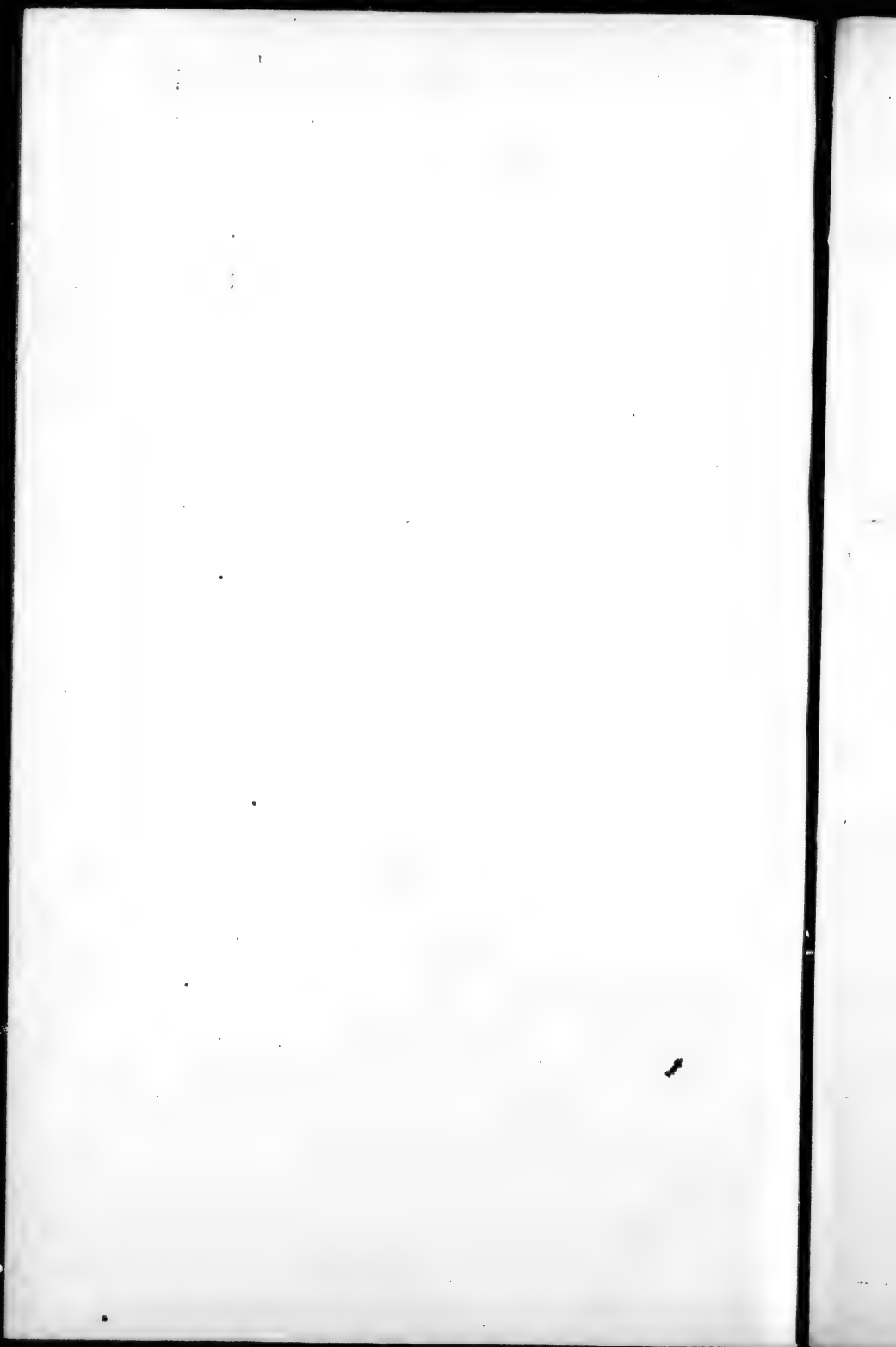


PLATE 43.

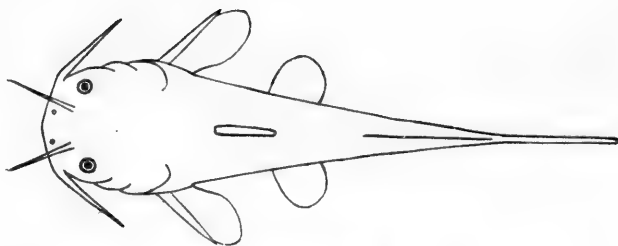


FIG. 69.—*Noturus stialis* Jordan.
White River, Indiana. (Type, nat. size.)



FIG. 69 (b)—*Noturus gyrinus* (Mitch.) Raf.
Hudson River. (Nat. size.)

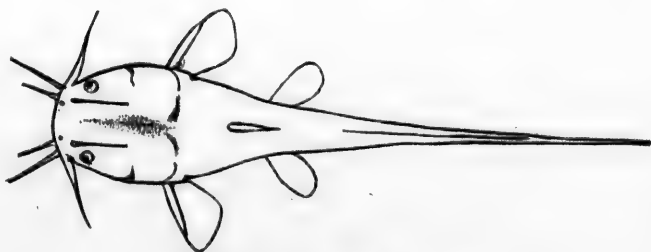


FIG. 69 (c)—*Noturus gyrinus* (Mitch.) Raf.
Hudson River. (Nat. size.)

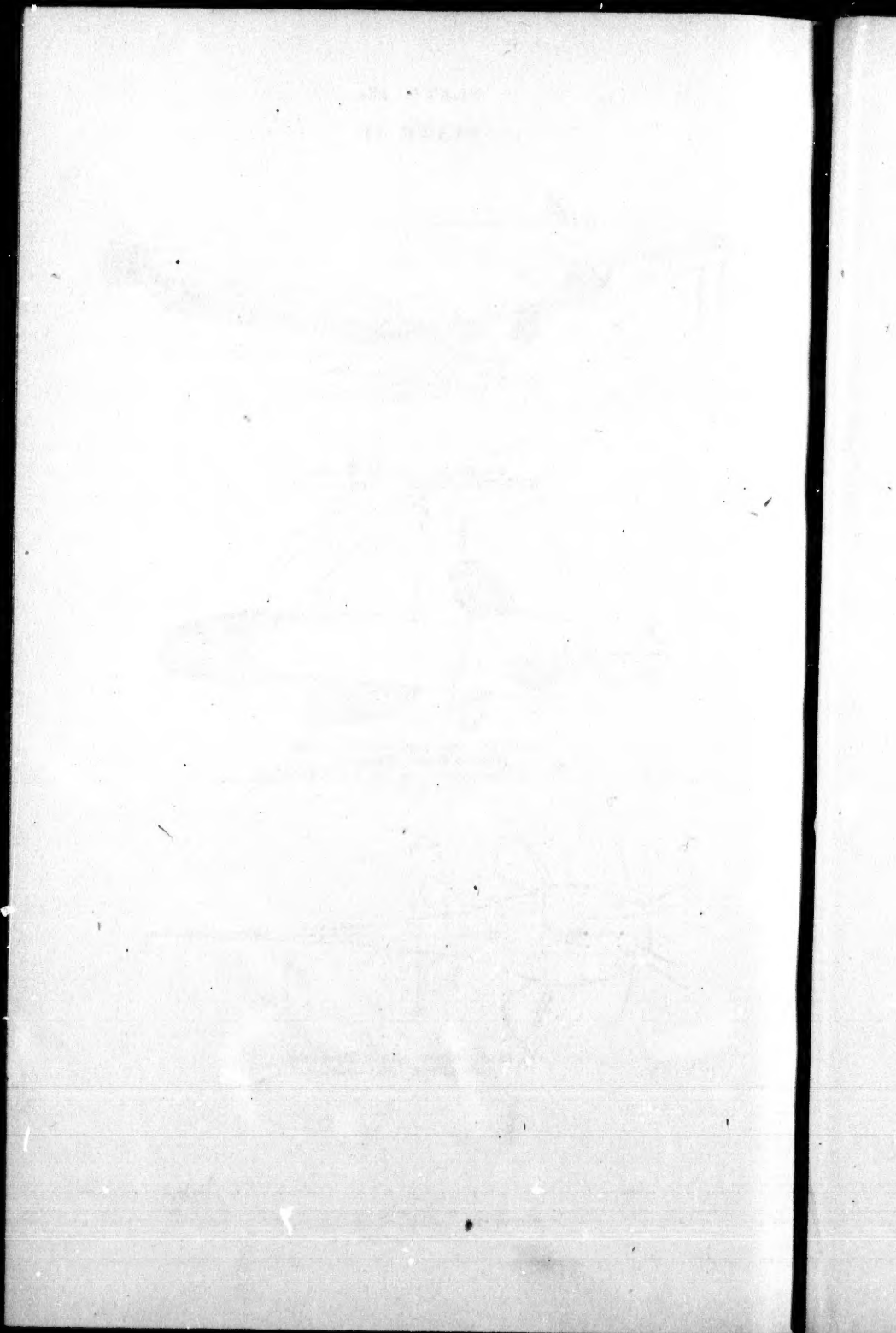


PLATE 44.

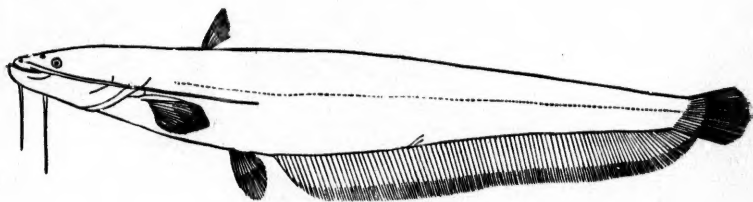
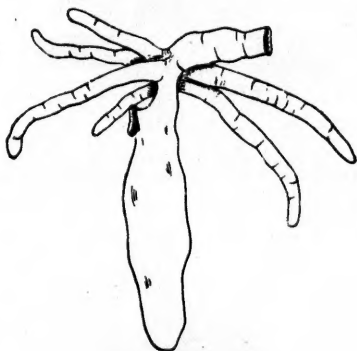
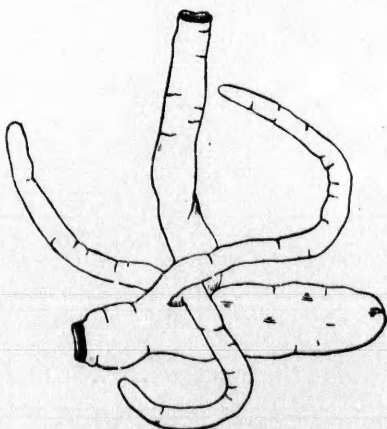


FIG. 70.—*Silurus glanis*, Linn.
European Catfish; Sheatf.h.
Lake Neufchatel, Switzerland.



Pyloric caeca (a)
FIG. 71.—*Stizostedion canadense* (Smith) Jordan.
Reduced one-half.



Pyloric caeca (b)
FIG. 72.—*Stizostedion salmoneum* Raf.
Reduced one-half.

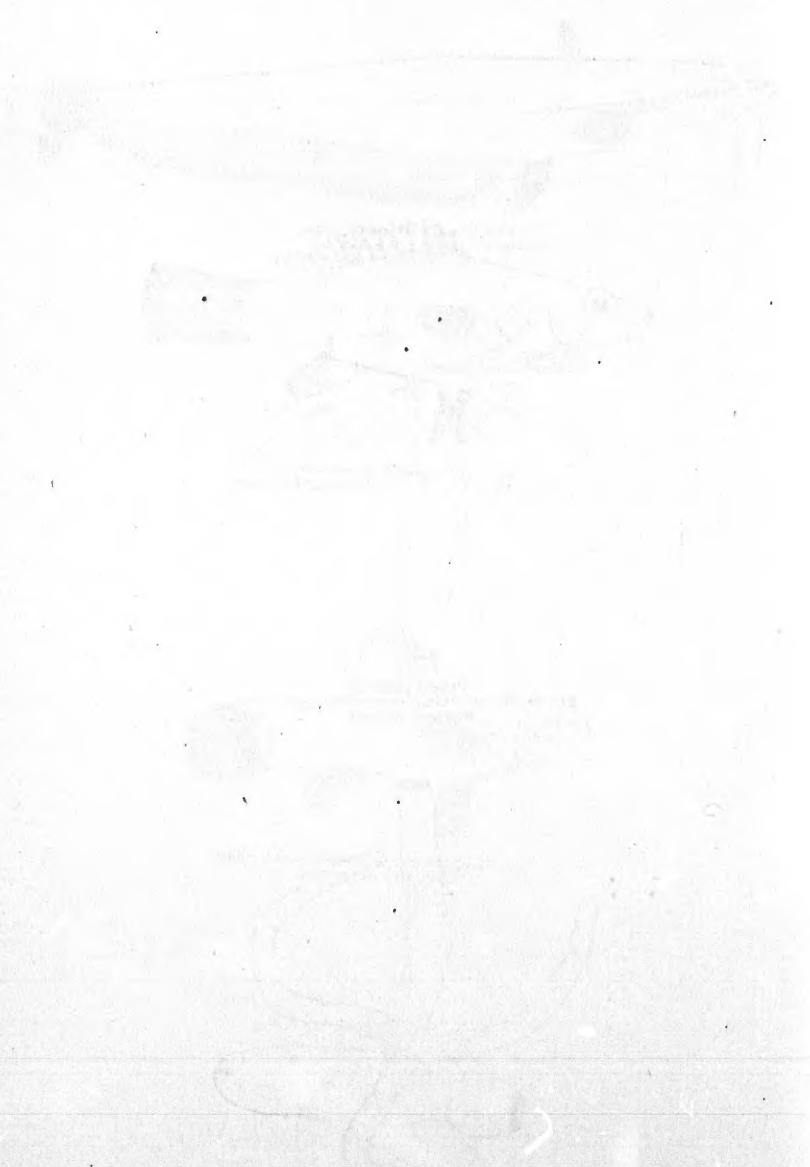


PLATE 45.

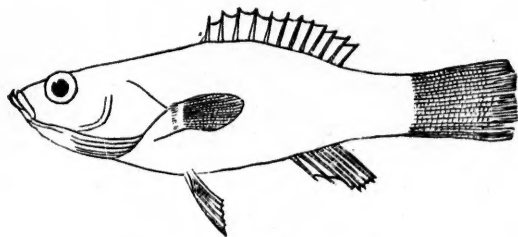


FIG. 73—*Elasmoma zonata* Jordan.
Little Red R., Ark. Type enlarged 3 diams.

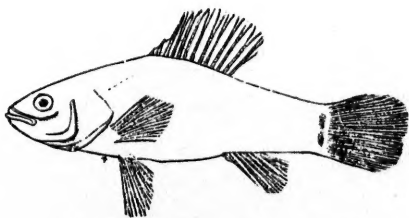


FIG. 74—*Asternotremia mesotrema* Jordan.
Little Red River, Ark.